MODEL PRC-150A

PACE

Electronic Services - Los Angeles
M16800X

"Systems for the Repair, Development and Production of Electronic Assemblies"

by

PACE
INCORPORATED

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MANUAL FOR BENCH TOP REWORK CENTER MODEL PRC - 150A

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Howard Associates 305 786 0205 (490 9860 ~~725 5220~~)

FOREWORD

I would like to take this opportunity to familiarize you with our organization and the role it plays in the field of maintenance.

PACE, INC., is dedicated to helping the "Maintenance Man" meet his responsibilities by providing Maintenance Systems to aid him in making repairs which restore equipment to its original quality and reliability standards. PACE, INC., also concerns itself with future maintenance problems and acts as a spokesman for the "Maintenance Man" so that repair needs are considered when new designs and specifications are initiated.

All PACE developed Maintenance Systems meet the following criteria:

Dynamic:	To meet changing design and manufacturing methods.
Practical:	To meet the daily realities of field needs.
Flexible:	To accommodate to the individual user's skills, knowledge, problems, and preferences.
Integrated:	To provide in a self-contained package the elements for accomplishing the complete maintenance task.

You, the user of our system, may have specific maintenance problems we have not anticipated. Your comments and recommendations would be helpful in making future systems more effective.

Sincerely yours,

W. J. Siegel

William J. Siegel
President

Note: - BEFORE THIS MAINTENANCE SYSTEM CAN BE PROPERLY USED, THE ENTIRE MANUAL MUST BE READ. BE SURE TO NOTE THE SECTION ON "SYSTEM ELEMENTS" WHICH PROVIDES DETAILS IN THE USE AND MAINTENANCE OF THE SYSTEM ITSELF.

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WHAT ARE YOUR RESPONSIBILITIES?

THE MAINTENANCE PROBLEM

The demands made on the skill and knowledge of maintenance personnel have grown at a rapid rate over the past two decades. Increased equipment complexity, miniaturization, and stringent operational requirements have placed an increasing burden on the "Maintenance Man" and his present facilities. Variations in manufacturing methods and techniques employed by the thousands of equipment producers often aggravate the overall problem of repair.

Sustaining Equipment Reliability is the responsibility of the "Maintenance Man" who must duplicate in the field, with limited facilities, what was originally accomplished in a modern factory with extensive facilities and personnel. In addition, the maintenance cost of equipment during its operational lifetime may run as high as five to ten times its acquisition cost. For these reasons alone the importance of maintenance cannot be overstressed.

WHAT IS REPAIR?

Usually we think of repair as replacement, adjustment or other actions which will return the unit under repair to its original functional capability. *THIS BEING CONFIRMED BY A DEFINED TEST REQUIREMENT.* However, there is another primary consideration to effective repair and that is to re-establish the unit's original reliability. *THERE IS NO SIMPLE TEST PROCEDURE OR TEST SET TO DETERMINE THIS.*

The idea that repair is simply part replacement is very far from the truth in most modern equipment. From a practical standpoint, repair of modern equipment is more of a de-manufacturing/re-manufacturing sequence requiring process controls.

Repair can be defined as: *THE RE-ESTABLISHMENT OF THE UNIT'S ORIGINAL FUNCTIONAL AND RELIABILITY CHARACTER WITHIN PRACTICAL LIMITS.* The limits are directly related to the capability of the individual performing the repair and the procedures employed.

WORK SYSTEM CONCEPT:

To meet this need, PACE, INC., has devised an approach called the "Work System Concept" which encompasses all of the primary elements for performing repair on almost any equipment with a minimum of degradation to the unit under repair. Similarly, this concept applies to prototype and experimental work as well.

The five primary elements that make up the "Work System Concept" are:

1. *SKILL OF THE MAN AND HIS COMPREHENSION TO APPLY IT.*
2. *DEFINITION OF THE RANGE OF WORK PROBLEMS THAT MUST BE COPED WITH.*
3. *DEFINED PROCEDURE OF WORK TO MEET THESE PROBLEMS.*
4. *INTEGRATED FACILITIES; i.e., PROCESSES, AIDS, TOOLS, ETC., WHICH ARE READILY ACCESSIBLE, EASILY SET UP AND DIRECTLY APPLICABLE TO ELEMENTS 1, 2 and 3.*
5. *QUALITY CONTROL OVER THE REPAIR ACTION.*

SKILLS REQUIRED:

What skills are required of the repair man? To answer this, let's look at the nature of the end products he may be called upon to repair. The unit under repair could be a Radar, Sonar, Communications System, an individual modular assembly or any number of devices that make up the total complex of "electronic systems." If we analyze these devices in terms of what human skills were involved in their original assembly at the factory, we can

ascertain the following: *ANY FACTORY PRODUCED END PRODUCT REPRESENTS A SUMMATION OF INCREMENTAL HUMAN SKILLS PLUS THE SUMMATION OF AUTOMATIC PROCESSING MACHINE CAPABILITIES.* (Note: Each person on a factory assembly line performs only an element of the total assembly and usually requires only an increment of skill.)

In order for the technician to accomplish high quality repairs, he must have the sum total of all the incremental skills used to originally produce the end product plus the ability, in effect, to duplicate the results of automatic processing machines. Thus we see the repair technician must be a broad range, highly skilled craftsman with plenty of "savvy."

Another burden on the repair man is that he does not work in the narrow skill range and highly repetitive manner of the factory worker, but rather in a broad skill range with low repetition, which offers less practice and demands more skill.

Finally, the individual repair technician has the total control over the reliability and quality of the operational hardware under repair since his repair actions can either maintain the equipment's original reliability or degrade it in varying degrees.

ARE TOOLS IMPORTANT?

We normally think of tools as being the key factor in any repair or manufacturing undertaking; however, upon close scrutiny we find that the tools, i.e., soldering irons, heat sinks, pliers, cutters, etc., are really inanimate objects of potential capability. The potential is only realized when a man with the necessary skill and comprehension can activate them. In essence: *ALL THE TOOLS, DEVICES, AIDS, ETC., ARE MEANINGLESS UNLESS THE USER HAS THE SKILL AND KNOWLEDGE TO APPLY THEM.* This is especially true of electronic repair work since most of the actions required are of a highly skilled nature rather than the simple selection and use of wrenches, screw drivers, etc., for part removal and installation.

WHAT MUST YOU BE?

As a repair technician or prototype builder you must, in essence, be a "One Man Factory System" encompassing all of the Human Skills, Processing Techniques, Production & methods Engineering, Quality Control Procedures and all of the other elements required to provide an end product of known reliability and quality.

WHAT DO WE DO?

The primary function of PACE, INC., is to aid you in performing as a "One Man Factory System." We endeavor to provide this aid in all five basic elements of the "Work System Concept." Although the subject matter that follows is an integral part of the solution, it is by no means the total answer. In the final analysis, no written word, manual, device, tool or aid can make a man skilled and knowledgeable. Only the individual's understanding, practice and desire can accomplish this. *THE FINAL SOLUTION IS REALLY IN YOUR HANDS.*

SYSTEM ELEMENTS

The many elements that make up this Maintenance System have been defined until now by general function. In this section, more specific information as to the make-up, use and maintenance of the various sub-systems is provided. Your specific system may have additional "Function Accessories" either supplied initially or added on at a later date.

We have tried to give you specific do's and don'ts, but in the final analysis it is important that you first learn about these sub-systems from the Manual and then actually try each Element so as to familiarize yourself with its operation and use. In almost all instances, practice will be required to establish an acceptable level of skill.

The basic System Elements which may be incorporated in the Systems are classified as follows:

a) Manual: - This covers the "Elements of Construction" of Modules, the Procedures for making repairs and the Use and Maintenance of the System, itself.

b) PACE Power Source: - Through this unit "quick connect" air pressure, vacuum, mechanical power, variable electrical power, as well as auxiliary electricals and controls are provided.

c) Sodr-X-Traction System: - The capability of melting solder and removing it via vacuum or pressure is provided by this unit.

d) MiniChine Miniature Machining System: - This unit provides the capability to Drill, Mill, Abrasive Clean, Grind and Polish various metallic and non-metallic materials.

e) ThermoPart Thermal Parting System: - This compact device provides a primary and safe means for removing thick conformal coatings from Circuit Board Assemblies without damage.

f) LapFlo Miniature Soldering System: - The "pencil-like" unit provides an extremely versatile, dependable and safe means of producing reflow soldered joints for flat packs or any component which is lap-mounted to a circuit board.

g) Special Aids: - These aids include the Hot Cubby and Cleaning System for storing and cleaning both the SODR-X-TRACTOR and soldering iron; the Pro/Vise with interchangeable blades for cutting, reaming and manipulating; and the ComForm I for cutting transistor leads to length.

g) Special Aids: - These aids include the Hot Cubby and Cleaning System for storing and cleaning both the SODR-XTRACTOR and soldering iron; the Pro/Vise with interchangeable blades for cutting, reaming and manipulating; and the ComForm I for cutting transistor leads to length.

POWER SOURCE, MULTI-PURPOSE

Before attempting to work with the PACE Power Source or the System, "FOR GOSH SAKE!" - PLEASE READ THE INSTRUCTION MANUAL.

DUTY CYCLE:

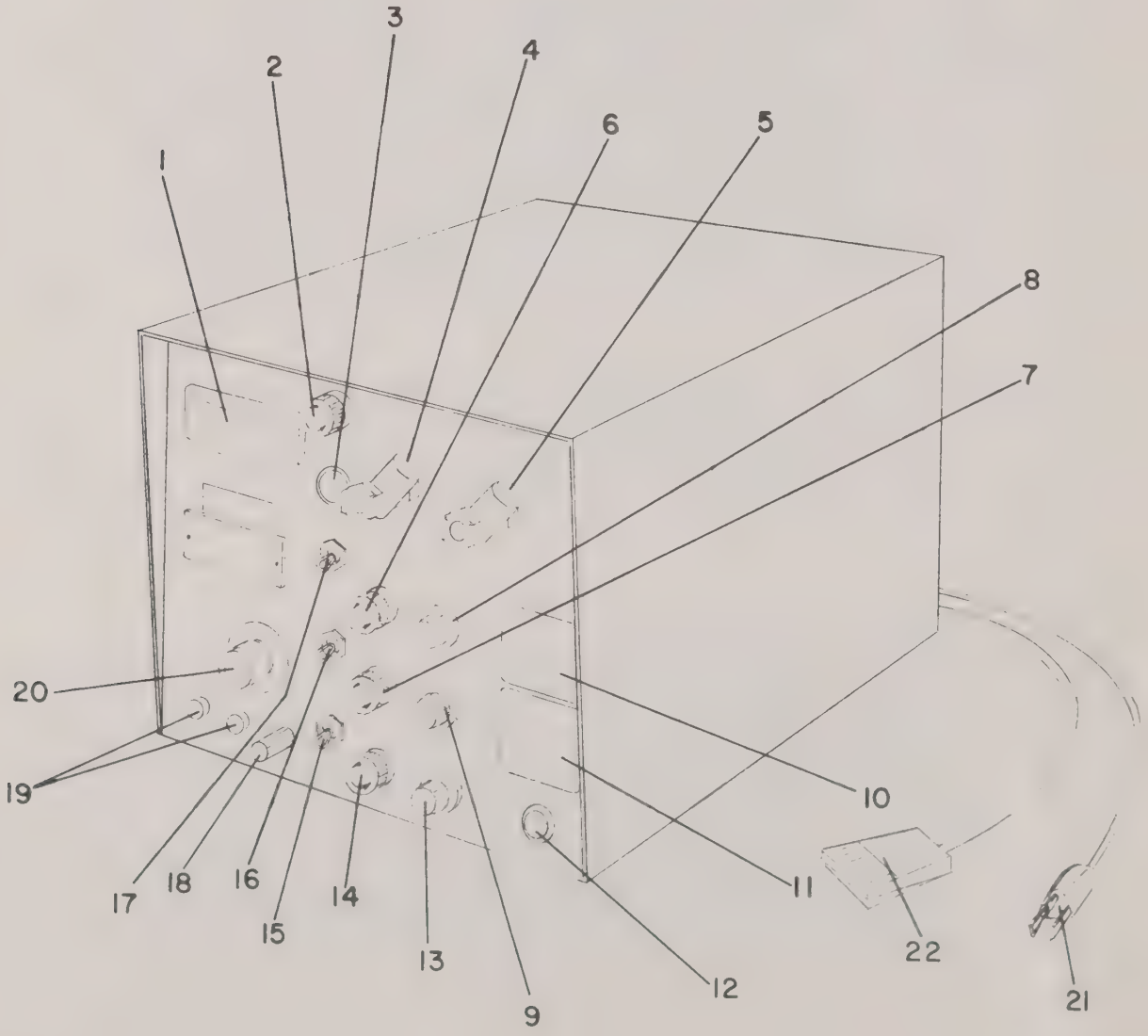
The basic differences between production processing and experimental, short run or repair-type processing is that production usually implies a repetitive use of individual processes, while short run, repair or experimentation implies a more limited use of many processes. The "use factor" is often referred to as the duty cycle of the equipment. Production normally requires high duty cycle use. PACE Power Sources and their associated Function Accessories are designed for short run repair and experimental usage and provide low duty cycle capability for a broad variety of processing in small and miniature classes of work. It is essential that the user of the equipment understand the nature of the Power Source and Function Accessories in terms of low duty cycle and not try to use its capabilities in mass production, high duty cycle applications.

In keeping with the desire to accomplish many different processes for short run, repair and experimentation, the set-up and use of the Power Source and any Function Accessory is of a rapid nature. Essentially, "quick-connects," rapid control settings and sequencing have been provided so that the set-up time for any process should average "one minute" or less.

NOMENCLATURE:

Before getting into the detailed usage of the Power Source and the associated Function Accessories, an initial familiarity must be established with all of the elements that are mounted on its front panel. The unit, itself, will provide Air Pressure, Vacuum, Mechanical Power, one level of infinitely variable low AC power and DC Power and two variable AC power forms in a variety of operational sequences. The basic idea is to provide any of these power forms, either individually or in combination, under controlled means, so as to drive a large assortment of Function Accessories. The Function Accessory, in essence, is a device that converts and applies the Power & Control of the Power Source to the Workpiece. In some cases the Function Accessory, itself, may have secondary controls and secondary power conversions.

The control panel drawing shows each face element called out with a number. The listing, by number, indicates the use for each of these elements. Please go through a familiarization with the panel drawing and the associated list of descriptions before proceeding further.



FRONT PANEL ELEMENTS & FUNCTIONS

1. DC Voltmeter - Readout for DC Output (#19).

2. Line Fuse - F4, 5 amp provides main unit protection.

3. Red Light - Indicates Main Power on.

4. Pressure - Variable Flow Control and "Quick Connect."

5. Vacuum - Variable Flow Control and "Quick Connect."

6. Fuse - F1, 2 amp provides protection to AC VAR Outlet (#10).

7. Fuse - F2, 2 amp provides protection to AC VAR Outlet (#11).

8&9. AC VAR - Variable Voltage Controls for Outlets (#10 & #11).

10&11. AC Variable Outputs - Variable Outlets, separately controllable from OFF to MAX line voltage. These are used for controlling temperature levels of SODR-X-TRACTOR, Soldering Iron, etc.

12. AC Electrical Power Output for Universal Cord. Controlled by Output Control (#13).

13. Output Control - for varying electrical Universal Output and DC Output (#12 & #19).

14. Fuse - F3, 2 amp SB, provides protection to Power Outputs (#12 & #19).

15. DC/Univ - OUT - Activates Power Outputs (#12 & #19) via foot pedal.

16. Motor/Cont./Pedal - Activates Motor Pump for Pressure (#4), Vacuum (#5), or Mechanical (#20) operations.

17. Power/On - Main Power ON/OFF.

18. GRD - Ground Terminal Post, Master Ground for Unit.

19. DC Electrical Outputs - DC Output controlled by Output Control (#13).

20. MiniChine - Output provides mechanical power. Also features Quick Connect while Running and Idle Modes.

21.
21. Line Cord - 3 wire grounded.

22. Foot Pedal - Activates Mechanical (#20), Pneumatics (#4 & #5) or Primary Electricals (#12 & #19). Sequenced by Motor/Out (#16) and DC/Univ Out (#15) Switches.

SET-UP & USE

a) All switches and control knobs should be placed in the OFF, OUT or "O" position before connecting power.

b) The Main Power Plug (#21) should be connected to a 115 VAC, 50/60 Hz power supply with proper grounding.

c) Place the Foot Pedal (#22) so that it will be comfortable and convenient to use. We find it more desirable to pass the cord around the rear of the bench to avoid more cords than necessary in front of the operator.

d) Place the ON-OFF Power switch (#17) to the ON position. The red indicator light (#3) will show that POWER is ON. The VAR AC Outputs (#10 & #11) can now be activated and controlled as can the DC/Univ. Outputs. NOTE: - These Outputs are independently controllable from OFF to a Maximum setting of 10. In the case of the AC VAR Outputs, line voltage is controlled from 0 to Maximum line voltage.

e) Place the MOTOR Switch (#16) to the Pedal position. Depress the Foot Pedal (#22) and an even, unstrained motor sound will be easily detected. If no sound is heard, release the pedal immediately and check for power hook-up.

f) Push MOTOR Switch up to OFF and place DC/Univ-OUT Switch (#15) up to DC/Univ. Depress the foot pedal and slowly turn the Output Control (#13) from OFF to 10. You will be able to read the linear increase in power now being supplied to Outputs (#12) and (#19) on the DC-VOLTMETER (#1). During normal operation of accessories powered by Outputs (#12) and (#19), the numbered settings on the Output Control (#13) can be used to establish repeatable settings for the variety of Function Accessories available with the Power Source. You may also use the DC VOLTMETER (#1) to establish repeatable settings. Push the DC/Univ. Switch (#15) down to the OUT position and continue.

g) Attach the "Hot Cubby and Cleaning Unit Assembly" to the right or left-hand side of the Power Source with the provided screws.

h) Plug the polarized 3-wire SODR-X-TRACTOR cord into one of the AC VAR receptacles.

i) Connect the black "Quick Connect" fitting for the SODR-X-TRACTOR on the end of the clear air line to the VACUUM Flow Control Valve (#5) using a 90^{O} twistlock principle to properly seat the "Quick Connect" fitting.

j) Connect the free end of the air line to the SODR-X-TRACTOR End Cap Baffle Assembly at the back end of the handpiece.

k) Beginning from the Baffle end of the SODR-X-TRACTOR, use the provided clamps to secure the air line to the 3-wire cord at uniform intervals. This will cause the tube and wire to act as one cord.

l) The soldering iron should be placed in the "Hot Cubby" holder and plugged into the other polarized receptacle.

m) Dress excess cords by running them from receptacles and air outlet, under the "Hot Cubbies" and away from work area, leaving the necessary lengths for working conditions.

n) Turn AC Variable Temperature Controls to Maximum setting of 10 for the Soldering Iron and SODR-X-TRACTOR and allow time for heating; then set to 6 or 7.

o) Vacuum and Pressure: The Vacuum and Pressure of the Center are provided with the "quick disconnects" for rapidly attaching Function Accessories. Pressure and Vacuum flow rates are variable from Min. to Max. By rotating the ball check assembly relative to the valve body, distinct flow rates can be set. The calibrations represent settings which, as experience will dictate, are required for specific situations.

The ball check portion of the flow control valves is factory set to maximum Pressure and Vacuum levels for the System. These settings may be reduced, if desired, by loosening the ball check caps. A simple, quick check of the Vacuum and Pressure supply can be accomplished as follows: momentarily block the Vacuum outlet (#5) and activate the motor while listening for the relief valve's operation. A slight hissing sound should be audible. To check the Pressure side, momentarily block the Vacuum outlet (#4) with your finger and listen for a slight hissing sound. If either of these checks is "OFF," all air connections, including In-Line filter caps, should be checked for possible leakage, to gain access, remove case screws and lift cover or use access techniques indicated by the unit you are working with.

p) Remove the lid from the Cleaning Unit by twisting and lifting and fill the cup with water so that the sponge is completely saturated. NOTE: Replace cap at the end of work day, pushing lightly until cap is snug.

q) Mechanical Power: The MiniChine has two positions for attachment at the MiniChine Output (#20) in the first position, an Idle Mode allows attaching to the Power Source without rotation of the spindle shaft assembly. The second position which "Quick Connects while Running" is the Operational Mode for the MiniChine(TM). Attach the spindle shaft assembly and with the Power Source programmed for pedal operation, step on the foot pedal, running the motor continuously and engage and disengage the MiniChine from the Idle Mode to the Operational Mode to get a feel for how it works.

POWER SOURCE MAINTENANCE

1. Cleaning Pump: Should excessive dirt, foreign particles, or vapors which solidify enter the pump chamber, the vanes will act sluggish because of increased drag. (The filters supplied with the unit will ordinarily keep this from happening). However, if this should occur, remove the three screws securing the end plate and carbon wear plate, take out the four vanes and wash with solvent. Dry, replace, and reassemble the end plate. This is a dry type pump and liquids of any type should never pass through it.

   Filter-Muffler: Dirty filters will restrict air flow. If not corrected, this condition could lead to early pump failure. Check Filter felts periodically and clean them at least once a month. The felts may be cleaned by removing them from the assembly and washing them in solvent. Dry them out and replace them in the assembly. Be sure to tighten the containers into their screw threads and against the gaskets to eliminate pump leakage through the filter-mufflers.

2. Protection: The Motor which drives the pump has FUSE F4 (#2) to to properly protect it on intermittent operation. Any time the motor is switched on and fails to turn over easily, it should immediately be switched off and checked. With reasonable care the pump and motor system will give thousands of hours of trouble-free service.

   FUSE F4 (#2) protects Main Power Line, FUSES F1 and F2 (#6 & #7) protect the Variable AC receptacles (#10 & #11) and their associated controllers (#8 & #9), FUSE F3 protects the Output Control (#12) and the associated Universal Output (#12) and DC Output (#19).

3. Duty Cycle: PRESSURE and VACUUM can be run continuously under normal loading conditions. Full blockage of PRESSURE outlet (abnormal load) should only be done on a momentary basis. MECHANICAL POWER can be run continuously with the only limit being the heating effects of the Flexible Drive and Spindle. In this event, stoppage for "Cool Down" would be necessary. SIMULTANEOUS LOADING. Loading both PRESSURE and VACUUM sides simultaneously will not cause damage but will reduce efficiency of both capabilities and is not recommended. Use of MECHANICAL POWER simultaneously with PRESSURE or VACUUM is recommended and it is suggested that the load orifices used for VACUUM or PRESSURE during this type of operation be as large as possible to provide maximum efficiency during this kind of use. In those cases where the highest possible Mechanical Torque Output is required, disconnect all VACUUM or PRESSURE loads.

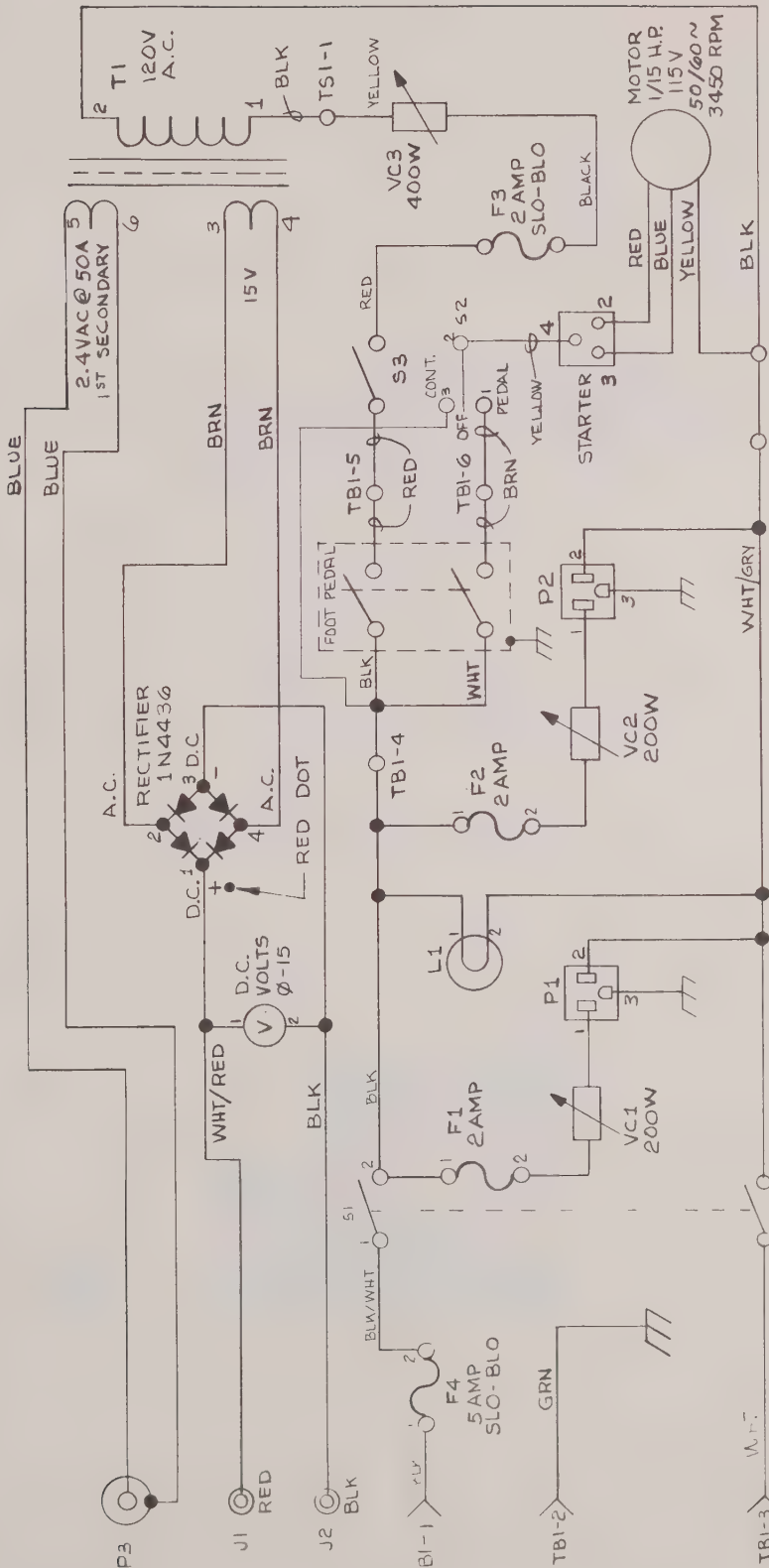
   The Duty Cycle for the Electrical Power Output is based conservatively on 50% Duty. For example, every 5 seconds of Power ON requires 5 seconds of Power OFF. The Miniature Soldering Units, Thermal Parting Units and Thermal Stripping Units may be operated continuously.

   Now we're ready to get to work. Read the instructions for each Function Accessory before using it. It is a good idea to practice with each accessory on a scrapboard to insure that the equipment is operating properly before attempting to use an accessory on good hardware.

Item #	Part Number	Descriptions
1	1198-0005	DC Voltmeter
2	1159-0002	Fuse, 5 amp, S.B.
	1161-0002	Fuse Holder for above
3	1165-0004	Red Lamp
4	1285-0003	Flow Control Pressure
5	1285-0004	Flow Control Vacuum
6 & 7	1159-0004	Fuse, 2 amp
	1161-0002	Fuse Holder for above
8 & 9	1285-0014	AC VAR Voltage Controls
	1222-0006	Knob for above
10 & 11	1207-0001	AC Receptacle, polarized
12		Universal Connector
	7000-0005	Universal Cord
13	1285-0018	AC VAR Voltage Controls (400w)
	1222-0006	Knob for above
14	1159-0005	Fuse, F5, 2 amp SB
	1161-0002	Fuse Holder for Above
15	1157-0003	Power Switch (SPST)
16	1157-0004	Switch SPDT-CO
17	1157-0001	Switch DPST
18	1205-0062	Ground Terminal Post
19	1207-0042	Red Receptacle
	1207-0043	Black Receptacle
20	1338-0007	Housing Adapter
	1349-0001	Rubber Grommet
	1261-0013	Quick Connect Shaft Adapter
	1221-0022	"C" Spring
	1251-0001	Ball Bearing
	1336-0013	Motor Pump Assembly
	1194-0003	Starter for Above
21	1332-0023	Power Cord
22	6008-0022	Foot Pedal Assembly

INTERNAL COMPONENTS

1196-0001	Rectifier
1192-0009	Transformer


T1
120V A.C.
2.4VAC @ 50A
1ST SECONDARY
15V
BLK
TS1-1
YELLOW
VC3
400W
F3
2 AMP
SLO-BLO
BLACK
MOTOR
1/15 H.P.
115 V
50/60 ~
3450 RPM
RED
BLUE
YELLOW
BLK
TS1-5
TS1-4
STARTER
S3
CONT.
PEDAL
OFF
TB1-5
TB1-6
FOOT PEDAL
BRN
WHT
WHT/GRY
P2
VC2
200W
F2
2 AMP
TB1-4
RECTIFIER
1N4436
A.C.
D.C.
RED DOT
D.C. VOLTS
Ø-15
L1
P1
VC1
200W
F1
2 AMP
WHT/RED
BLK
BLK/WHT
F4
5 AMP
SLO-BLO
GRN
P3
J1
J2
TB1-1
TB1-2
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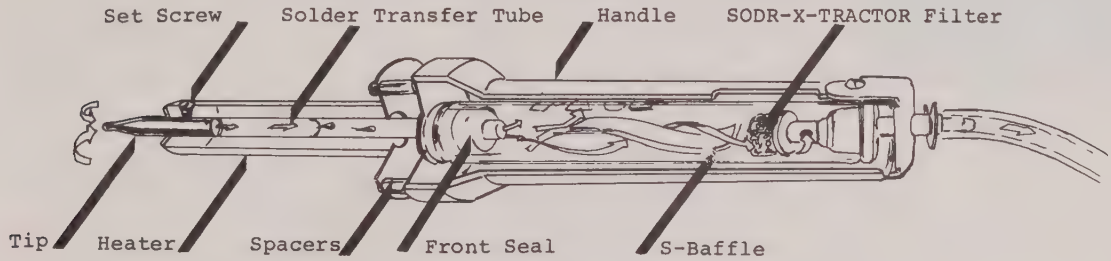
SODR-X-TRACTOR OPERATION

The SODR-X-TRACTOR easily and reliably removes most solder joint configurations.

This single, remarkable tool, properly used, is a great aid towards your goal: Non-Destructive Electronic Module Repair.

SODR-X-TRACTOR OPERATION PRINCIPLE



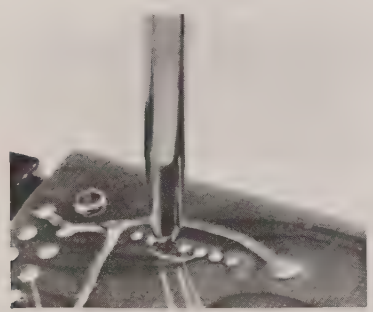
The SODR-X-TRACTOR functions as a vacuum cleaning device for solder removal.

The heated SODR-X-TRACTOR tip quickly melts the solder. Depressing the foot pedal with the Power Source in the mechanical mode activates the vacuum transferring the solder from the circuit board to the protected safety chamber in the handle.

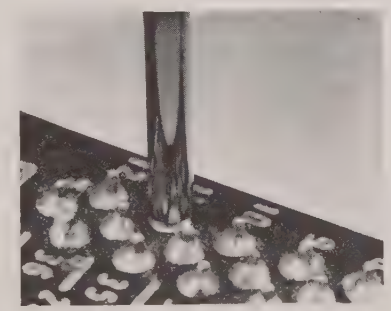
TIP SELECTOR GUIDE

A. TIP SELECTION:

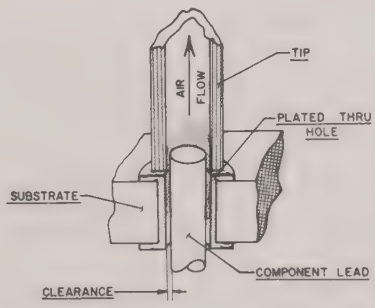
One of the most important aspects for successful Solder Joint Removal is the selection of the proper size Tip. There are several points to keep in mind.



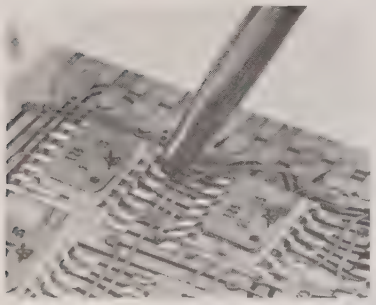
1. Match the tip to the work. Small tips for small pads.



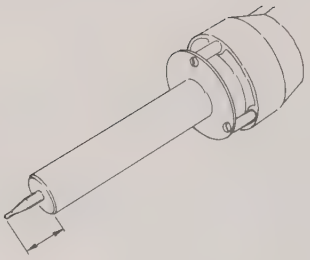
2. Large tips for heavier work.



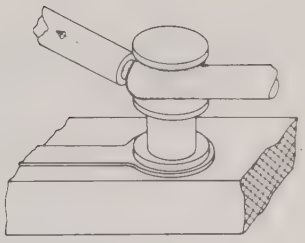
3. The tip should fit loosely over the component lead to be desoldered. The loose fit provides the necessary clearance for air and molten solder flow.



4. The O.D. of the tip should be smaller than diameter or width of the pad, to keep the hot tip in contact with the pad; not the substrate.



5. The selected tip extends approximately 5/8" or 1.5cm beyond the heater body for all normal desoldering.



6. Use the largest tip which can be applied to the soldered area to be extracted.

The SODR-X-TRACTOR Tip should be treated as you would your soldering iron tip. Before each Solder Joint Removal operation, excess solder should be lightly wiped off on the brush of the Cleaning Unit. Oxides are then shocked off on the saturated sponge.

Normal Tip extension is 1/2" to 5/8" from Tip end to heater end.

The Set Screw is treated with a special, high temperature, permanent lubricant and does not require further lubrication. However, the screw should be loosened in its thread seat at least once every 8 operating hours. WARNING: - When tightening a new Tip into place, the Set Screw is tightened 1/4 turn beyond the point of contact with the Tip. Turning the screw farther will crush the Tip out of round and cause it to jam in the heater assembly. After removal of a Tip, the in-line heater assembly should be cleaned with the small wire brush to remove the built up oxides which reduce heat transfer efficiencies.

SODR-X-TRACTOR Tips, like soldering iron Tips, wear out. The operator is cautioned to watch the Tip for wear so that the Tip can be removed before complete "Wash Out."

Rate of X-TRACTOR Tip "Wash Out" is directly related to:

a) Relative velocity of the molten solder.
b) Temperature of the Tip and solder.
c) Total area of contact of molten solder to interior side walls of Tip.
d) Total volume of solder removed.
e) Percentage of idling time at high temperatures.

Therefore, ascertaining the wear life of a specific type and size for a given application is best determined during active operations.

CONSIDERATIONS FOR TIP SELECTION.

Three Tip Types are available for the PACE Sodr-X-Traction System:

SUPER TIP -- Heavy Walled, Chamfered, Dual Clad Copper.
ALLOY TIP -- Special Alloy, Dual Clad, Chamfered.
DOUBLE WALL TIP -- Copper & Steel, Dual Clad.

TIP CHARACTERISTICS.

All Tips are consumable items. The principle of the Sodr-X-Traction Technique requires molten solder to be rapidly drawn through the Tip. As a result of this action, Tips are consumed by solder "Wash Out."

SUPER TIP - This tip provides the best ductility characteristics over the Alloy and Double Wall Tips and incorporates the following advantages:

1. Maximum heating capability.
2. Minimum potential for damaging pad areas and associated circuitry due to the matching of Tip and Circuit ductility at temperature.
3. Easily modified to suit specific work requirements. (Note: - Removal of Tip cladding will reduce life factors.)

Recommendation: SUPER TIPS are recommended for use on expensive boards. It should be remembered that the principle of Sodr-X-Traction is to recover, without damage, assemblies which are inoperable. The cost of the assembly must be the major consideration; not the price of the Tip.

ALLOY TIP - This Tip has a greater life expectancy than the Super Tip. Factors to consider here are as follows:

1. Heating capability and potential for modification are similar to SUPER Tip. (Note: - Removal of Tip cladding will reduce life factors.)

2. The relatively harder nature of the alloy of the ALLOY Tip at temperature permits its use in unclinching leads without bending, increases its life factor, but also increases its mar factor.

Recommendation: It is suggested that this Tip be used for continuous operation where medium price assemblies are being reworked and repaired. This Tip will prove most economical for the medium range of work where extended Tip life is considered to be an important factor and potential for marring work surfaces is limited.

DOUBLE WALL TIPS - This Tip has a life expectancy greater than the SUPER Tip. Selection of this Tip type should be based on the following characteristics:

1. Heat transfer characteristics of the Double Wall Tip is slightly less than Super Tips but provides the best life characteristics of all. This tip should not be modified.

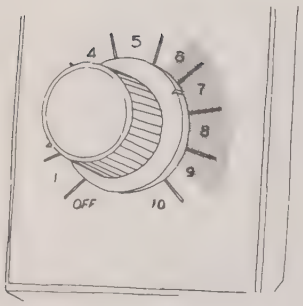
2. Tip has greatest strength with double wall design and can be used for unclinching of heavy leads.

Recommendation: This Tip should be used where best life and strength are desired, and for tasks such as wave soldering touch-up, component salvage and other work where contact with pads or circuitry is minimal.

CUSTOM TIPS:

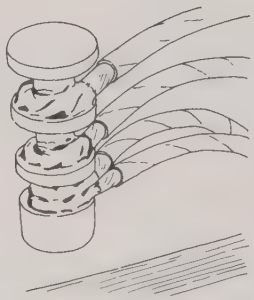
PACE Will provide Custom Tips for specific applications upon the request of the customer.

HEAT SELECTION



1. Most solder joints can be extracted with a heat reference setting of between 6 and 9.

   As a general rule, always use the maximum heat to which you can safely react.



2. Higher temperature settings may be required for solder extraction on large turret terminals or multilayered printed circuit boards.

3. Auxiliary heating is required if extractor tip alone can't melt solder joint in 3-1/2 seconds or less.

1. Variable Heating Control.

   Tip temperatures of the soldering iron and SODR-X-TRACTOR can be controlled independently by adjusting the associated AC VAR knobs. For average work, the SODR-X-TRACTOR should be operated at a setting between 6.5 and 8. However, if the Solder Joint does not completely melt in approximately one second, the temperature setting may be raised in increments to achieve rapid solder melt and ideal setting.

Settings are repeatable and should be recorded for specific job requirements. For the average Hot Air Jet Mode of Operation, temperature setting of 7 to 10 is used. When working with large Solder Joints and multilayer boards, higher temperature will be required for successful Solder Joint Removal. (See Aux. Heating Procedure.) When not in continuous use, the SODR-X-TRACTOR should be allowed to idle at a temperature setting of 4 on the reference scale of the Variable Heating Control. NOTE: - To reduce Tip temperature rapidly, first lower AC VAR setting and then use Air Pressure to blow cool air thru the Tip and heater for twenty seconds. Allow fifteen seconds for temperature stabilization. Increase or decrease of effective heating of the Tip will also depend on how far the Tip extends out of the SODR-X-TRACTOR heater assembly.

2. Pressure and Vacuum Control.

   a. Pressure and Vacuum flow rates are variable from Min. to Max. By rotating the Ball Check Assembly relative to the Valve Body, distinct flow rates can be set. The calibrations represent settings which, as experience will dictate, are required for specific situations.

   b. The ball check portion of the Flow Control Valves are factory set to maximum Pressure and Vacuum levels for the system. These settings may be reduced if desired by loosening the ball check caps.

MODES OF OPERATION:

1. Vacuum Mode.

   The Vacuum Mode of Operation is suited for the removal of Surface and Reinforced Hole Solder Joints; (i.e., those found on Single-sided boards, Double-sided boards, Plated-thru-Holes, Eyelet and Funnelet Reinforced Holes, and Standoff Terminals.) Use maximum Vacuum setting.

VACUUM CONTINUUM

The SX-200 is designed to make specific use of the principle of VACUUM CONTINUUM. After the initial surge of Vacuum removes the free solder, the Vacuum must be continued for approximately two seconds while oscillating the lead with the X-TRACTOR Tip to cause a cool down of the lead, hole and pads, thus preventing parts from re-sweating to each other. Failure to make use of VACUUM CONTINUUM in conjunction with a stirring or oscillating motion of the lead with the Tip of the SODR-X-TRACTOR will allow sweat joints to form with consequent hole or pad tear out when pulling leads. An additional side effect of not

maintaining Vacuum for at least two seconds is possible blockage of the X-TRACTOR heater tube since sufficient time is not provided for molten solder to travel the length of the tube and enter the chamber. If blockage should occur, as a result of insufficient Vacuum Continuum, see Section on "Heater Removal and Replacement."

1. Surface Solder Joint Removal includes Single-sided boards, Double-sided boards and Standoff Terminations. To remove these Solder Joints, the properly selected Tip is placed on the Solder Joint. When Solder melt is observed, depress the foot pedal to achieve the Vacuum. As solder is removed and the air is flowing through Joint, draw the Tip away from the pad area and allow the Vacuum Continuum to draw cool air through the Solder Joint area as you oscillate the lead in the hole to prevent sweating of the lead to the pad. If lead is clipped and termination is straight-thru, the lead and solder will be removed simultaneously.

   a. Clinched Leads:

      Where leads are clinched, the heated Tip of the SODR-X-TRACTOR should be placed at the lead bend. The solder is then melted and X-Tracted, removing as much as possible. Then the Tip is used as a lever to straighten the clinched lead, avoiding touching pad or board surface. (NOTE: - Super Tips will bend when used on large diameter leads. Therefore, use Alloy Tips or the soldering iron for straightening.) Allow time for cool down. Heat and Vacuum are applied for a second time to remove residual solders. The slight oscillating motion which is produced by rotating the Tip is performed to prevent leads from re-sweating while Vacuum Continuum cools the lead and pad areas.

      A second method for removing clinched leads is accomplished by notching the Tip to allow it to fit over the clinched lead. When solder is extracted, a slight oscillating motion at the Tip, in conjunction with Vacuum Continuum is employed as before, thus preventing re-sweat of the lead to the pad.

      After the Solder Joint is removed, the lead may be mechanically straightened with pliers. However, if a slight sweat joint remains, mechanical shearing action can be employed without touching the pad area. Pre-clipping clinched lead will allow solder and lead to be removed simultaneously.

   b. Double-sided Boards with no hole support have two separate Solder Joints which must be removed independently of each other. Whenever possible, leads should be clipped on the component side, leaving a straight stub so that removal of the second solder joint will also remove the lead. Where leads cannot be clipped,

or where components must be saved, a heat sink should be used between the component body and the Solder Joint. The Solder Joint on the component side of the board is removed first (a notched tip may be desirable.) The Solder Joint at the lead termination is then removed.

c. In situations where a pad has no circuitry associated with it, it is recommended that the Tip be maintained slightly angled to the pad during initial vacuum application. Maintain a slight downward pressure to provide reduction of vacuum pick-off forces while using Vacuum Continuum for surface cooling. DO NOT stir lead.

2. Reinforced Holes include boards with Plated-thru-Holes and Eyeletted or Funneletted Holes. The principle of Solder Joint Removal for Reinforced Holes is distinctive and quite different from the problems associated with Surface Solder Joint Removal. This is due to the problem of leads re-sweating to side walls. The use of Vacuum Continuum and additional dwell time is mandatory for the removal of Thru-Hole or Reinforced Hole Solder Joints.

a. Place the heated tip on the Solder Joint using the lead and solder as the primary vehicle to transmit heat into the Joint. NOTE: - The principle heat transfer vehicle is the solder and lead. Pads and reinforced holes should not be used as the primary vehicle for transfer of heat.

b. Watch for the solder melt on the opposite side of the board as an indication of the through melt. When this is observed, activate Vacuum. After the initial surge of Vacuum clears the hole, raise the Tip slightly so that it is not in contact with the pad. Allow Continuing Vacuum to cool down the Joint area while stirring the lead to prevent it from sweating to the reinforced hole wall. Stirring is not necessary where lead is clipped and is X-Tracted with the initial Vacuum surge.

c. NOTE: - If the Solder point is not completely removed on the first attempt, DO NOT TRY TO REHEAT and extract. Allow the Joint to cool down. Re-solder the Joint with the Soldering Iron and again allow time for the Joint to cool. Now, repeat the Sodr-X-Traction procedure, allowing more time for the Joint to melt completely before applying the Vacuum.

AUXILIARY HEATING

Situations may arise where the SODR-X-TRACTOR cannot provide sufficient heat to successfully melt and remove certain Solder Joint Configurations, particularly those which are found in multilayer boards with internal ground planes and heat sinks. Recommended procedures for these situations are as follows:

a. Set SODR-X-TRACTOR temperature control to 7.5 and Soldering Iron temperature control to Max.

b. Place the circuit board in a vertical position in a work holding fixture.

c. Apply heat with the Soldering Iron Tip along the component lead from the component side of the board while simultaneously applying heat with the SODR-X-TRACTOR from the termination side.

d. When a melt is achieved, apply vacuum and remove molten solder. Remove soldering iron Tip. Be sure to oscillate lead with the X-Tractor while applying Vacuum Continuum.

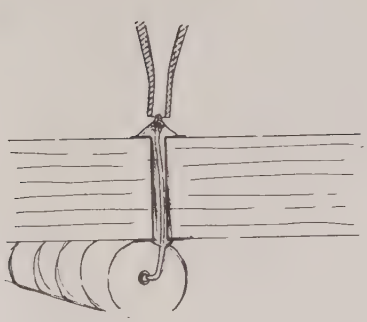
2. Pressure Mode.

Circumstances may occur where the Vacuum Mode of Operation will not completely remove a Solder Joint. This is most often the case where "Blind-sided Solder Joints" are found. The "Blind-sided Solder Joint" is so named by virtue of its inaccessibility, usually on the component side of the board. Where components are bonded or conformally coated, no air path exists through the board, thus preventing the Vacuum removal of molten solders in Reinforced Holes. In this instance, start in the Vacuum Mode with the Tip slightly angled relative to the pad to permit turbulent vacuum flow which will permit most of the solder to be removed from the hole, leaving behind a Back Side Solder Joint on the Blind side.

The Pressure Mode is now required to break up this Blind Side Solder Joint, using the following steps:

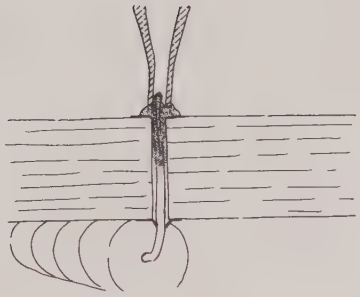
a. Connect the air line "Quick Connect" to the Pressure Flow Control Valve and adjust Pressure to Maximum.

b. Place the Tip into the "Solder Dump" tube between the two "Hot Cubbies" and with a burst of pressure clear any molten solder which might be in the heater tube or Tip.

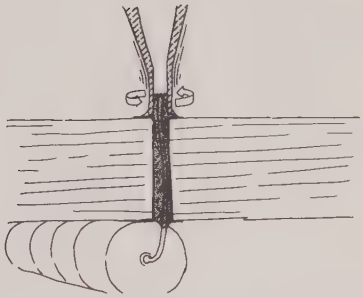


1. Select the proper dia. tip per Tip Selection guide.

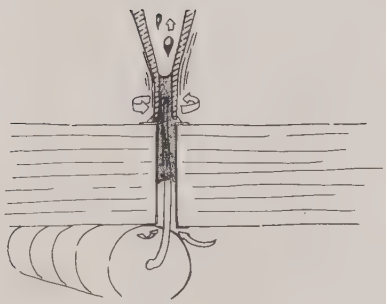
   Select heat setting.



2. Slip tip over lead perpendicular to the PCB.

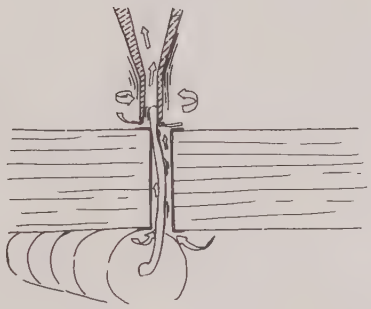


3. Move Desoldering Tool with rotary stirring motion dwelling until the lead moves freely within hole. Free movement of lead within the hole indicates complete solder melt ready for extraction.



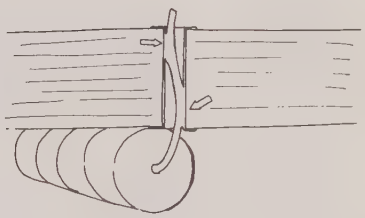
4. Apply vacuum and continue stirring action during Vacuum application.

NOTE: - Tip is in light contact only with pad. Heat transfer is through the lead wire and molten solder; not the pad and hole plating.



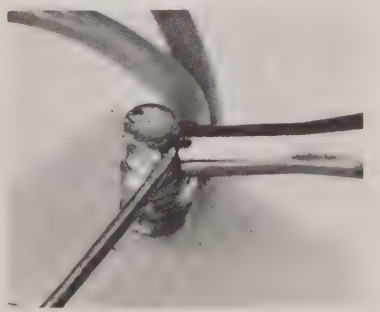
5. Continue Tip Motion and Vacuum Flow to cool joint area. Vacuum Flow must continue for a second or so after the tip is removed from the work.

CAUTION:-Don't push; light contact between the pad and the tip works best.



6. Check your work. If all solder is not extracted from any thru-plated hole, re-solder and extract again. Allow cool down between soldering and extraction.

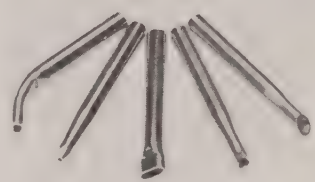
7. Solder joint removal from multilayer printed circuit boards may require application of a second heating source. Auxiliary heat can be applied with the PACE ConducTweez Heating System or with a soldering iron tip.



8. Place heated extractor tip in intimate contact with wire and solder; watch for complete solder melt.

   Apply motion to wire.

   Depress PED-A-VAC to activate vacuum and extract solder.



9. Tips may be modified by filing, notching or bending for special desoldering applications.

Heat must be transmitted through the lead to melt the Blind-sided Solder Joint. Place the heated Tip over and in contact with the lead. DO NOT ALLOW THE TIP TO COME INTO CONTACT WITH THE PAD AREA.

When the Blind-side Solder Joint is heated sufficiently, seal off the Joint lightly with the SODR-X-TRACTOR Tip and depress the foot pedal for a continuous burst of Pressure. Stir the lead to prevent the reformation of sweat joints while the stream of air cools down the Solder Joint area.

3. Hot Air Jet Mode.

Lap or Planar mounted Surface Solder Joints are removed with the Hot Air Jet Mode of Operation. The following steps should be taken for the successful removal of Lap Soldered Joints.

a. Set SODR-X-TRACTOR temperature to Maximum.

b. With the air line connected to the Pressure Flow Control Valve, set Pressure to Max. Depress foot pedal several times to blow excess molten solder into the "Solder Dump" between the "Hot Cubbies." Blow again into the spatter shields of Cleaning Unit to make sure no solder remains in heater tube.

c. Reduce the Pressure setting to Min. Hold the SODR-X-TRACTOR Tip (small ID) directly over a piece of paper or tissue approximately 1/4" away from the surface. Depress the pedal and adjust the Pressure Flow setting so that the Hot Air Jet scorches the paper within 1 to 2 seconds.

d. A carefully directed Hot Air Jet will melt the solder of a Lap Joint when the Tip is held approximately 1/4" from the surface of the Joint. When the solder melt is observed, the lead is lifted with a soldering aid or tweezer. Attempts to lift the lead before the solder is fully molten may damage the assembly.

e. Repeat this process for each individual lead until all leads are removed and component is free.

General Note: - If Lap Soldered Joints are heavily mounded with solder, it may be desirable to use the Vacuum Mode to remove excess solder prior to using the Hot Air Jet Method of removal.

f. Preparation of Pad Areas for Remounting.

1. To clean pad areas, use the Vacuum Mode. Keep tip at an angle to pad surface. Heat the solder, observe the melt, and extract, using a wiping action across the pad.

2. Tin pads and resolder new pack.

g. Reflow Soldering.

If desired, solder may be reflowed using the Hot Air Jet. Direct the stream of Hot Air with tip 1/4" away from pad area. Solder will melt and observable reflow will take place.

h. Heat Shrinkable Tubing.

To use the Hot Air Jet Mode of Operation for shrinking tubing, apply the properly adjusted Jet slowly along the entire length of the tubing. Do not play the hot air at one point, but evenly distribute heat to shrink tubing. Be sure all tubing has shrunk completely before allowing it to cool.

CONFORMAL COATINGS

As a general rule, Conformal Coatings should be removed prior to Solder Joint Removal to minimize heat dissipation and to prevent volatiles and residues from fouling Power Source and SODR-X-TRACTOR mechanisms. Use approved methods for coating removal or contact PACE for removal methods for all types of Conformal Coatings.

Where coatings are thin, 5 to 10 mils, Solder Joints and coatings can be removed simultaneously by Vacuum extraction with molten solders acting as the vehicle to wash highly localized surfaces free of coating residues.

i. Localized Coating Removal.

An accurately controlled, fine jet of hot air can be used to decompose thin coatings of epoxies and polyurethanes.

To remove coatings, adjust the Hot Air Jet Mode of Operation to a suitable heat setting. (Be sure to dump solders in the "Solder Dump" before using the Hot Air Jet.) Slowly play the Hot Air Jet on the part or coated area which is to be removed with the tip held approximately 1/4" to 1/2" from the area.

Heat should be distributed over the entire area so that the coating will decompose evenly. This will enable the operator to observe decomposition of the coating which can then be removed with a blunt, plastic or wooden tool, such as an "orange stick." Use of metal scrapers for this purpose can damage the circuitry of the Workpiece.

j. Removing Bonded Parts.

1. Once Solder Joints have been removed or the leads pre-clipped, bonded components can be efficiently removed using the Hot Air Jet Mode of Operation by playing the Hot Air evenly around the component until the coating is decomposed.

2. Multi-pin Component Removal.

For TO-Can configurations where Can is on Transipad or contacting board directly and is bonded thereto, thus preventing pre-clipping of leads, Solder Joints must be removed by Sodr-X-Traction methods before attempting component removal.

a) Clear an air path on the component side of the Board to be sure that Vacuum extraction is effective.

b) If an air path cannot be provided, sweat joints may occur on the component side of the board if holes are plated-thru. In this case, use Vacuum Mode and then the Pressure Mode of Operation to clear the Solder Joints before attempting removal of the bonded component. (See Pressure Mode of Operation.)

Use Hot Air Jet to de-bond component. Other methods for removing coatings which are thicker than 5 to 10 mils may be found in the MiniChine and ThermoPart Sections of this Bulletin. Contact PACE directly for methods and procedures for your specific problems, providing samples, if possible.

MULTI-PIN PARTS

The same principle that is used to extract one lead is used to remove components with multiple leads. Each lead and associated Joint is treated as an entity to provide minimum heating effects to total Workpiece, while assuring effective removal of each Solder Joint. CAUTION: Double check that each lead is free in the hole before attempting to remove Dual-In-Line Packs, TO Cans or other multi-pin devices. A few extra seconds to accomplish this will be worth the time and effort. Use tweezers, good lighting and optical aid to assure that each lead is freely moving in the plated-thru holes. Re-solder and repeat extraction process on any doubtful Joints.

DUAL SODR-X-TRACTORS

In areas where heavy workloads require the use of Pressure or Hot Air Jet Modes of Operation in conjunction with Vacuum Modes of Operation, it is desirable to use two SODR-X-TRACTOR Handpieces operating from the same Power Source. This enables the operator to have the ability to quickly change Modes of Operation without having to change temperature settings or Quick Connect Air Tube Fittings. Each Handpiece has its own temperature control and is easily accommodated in the Hot Cubby. NOTE: - To obtain maximum efficiency when using Dual SODR-X-TRACTORS, the Handpiece which is idling should have its flow control set at Min. This will allow for maximum efficiency.

SYSTEM MAINTENANCE

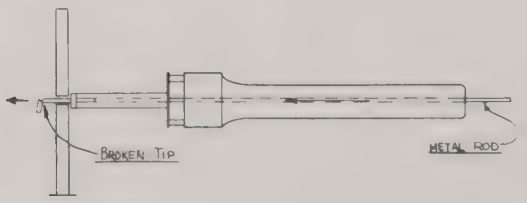
A. TIP CARE:

SODR-X-TRACTOR Tips should be cared for in the same manner as Soldering Iron Tips. Tips should be kept clean.

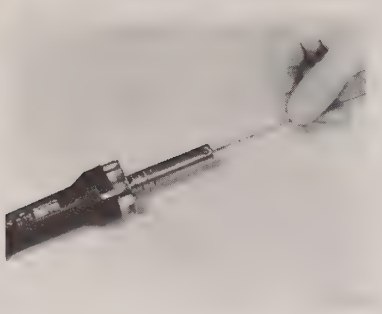
1. Before each Sodr-X-Traction or soldering operation, the Tip should be wiped lightly on the wire brush of the cleaning unit. This should remove excess solder and flux. The Tip is then lightly touched to the clean, water-saturated sponge to shock off oxides.

2. Care must be taken to watch for SODR-X-TRACTOR Tip washout. The Tip must be removed before it becomes so thin that it breaks off in the heater assembly.

   If the Tip does break off in the Heater Assembly, a steel rod slightly less than 1/8" in diameter should be used to ram the broken Tip out of the Heater tube while the SODR-X-TRACTOR is idling hot. With set screw removed, insert ram rod from baffle end, support front face of heater and drive it out. (See Sketch.)



CARE AND MAINTENANCE



1. Keep the SODR-X-TRACTOR Heater Tube Assembly clean with the wire brush.

2. Clean the Glass Chamber and S-Baffle with the bristle brush as often as necessary for full vacuum flow.
Coat the inside of the Chamber and the S-Baffle very lightly with mineral oil for ease of cleaning.

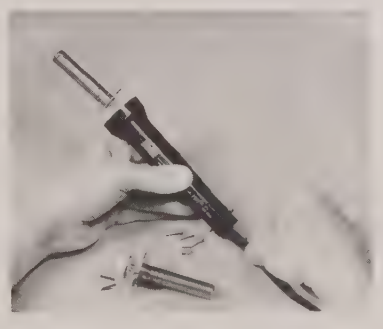
3. The SODR-X-TRACTOR Filter at rear of the Glass Chamber prevents flux and coating residues from reaching the PED-A-VAC. Replace filter as required, for maximum air flow.

4. Heater tube blockage may result from failure to maintain Vacuum flow 2 seconds after solder joint extraction.

5. To clear blockage, remove tip, set heat to maximum, melt about 18" of 1/16" solder into heater tube.

6. Insert a 3/32" dia. copper o brass rod into heater tube. Solder and rod transfer heat to melt and clear blockage.

7. S-Baffle must fit firmly in place away from heater. Bend for firm retention.



8. To replace heater, disconnect cord and cool; remove 3 retaining screws, push cord through handle. NOTE: - Ground lug and metal spacer are assembled on same screw.

9. Carefully slide heater connector pins from line cord receptacles. Reverse operation to install new heater and seal assembly.

B. TIP REPLACEMENT:

When changing Tips in the soldering iron or SODR-X-TRACTOR, the following steps are recommended:

1. While the unit is idling hot, back out the permanently lubricated set screw to free the Tip in Heater Assembly, but do not remove screw completely.

2. Remove the Tip from the Heater.

3. Clean Heater with small wire brush to remove oxide buildup.

4. Place new Tip in Heater.

5. Tighten set screw 1/4 turn past the point of contact to secure Tip in place. For Soldering iron tighten screw holding screwdriver with thumb and middle finger. Tighten screw only as far as pressure from thumb and middle finger allows.

   NOTE: - Although set screws are permanently lubricated, it is essential that they be loosened at least once every eight operating hours.

C. CLEANING:

To obtain the maximum results from the complete Sodr-X-Traction System, the following maintenance must be performed.

1. Heater Tube Assembly must be thoroughly cleaned at least every eight operating hours with wire brush.

2. The Chamber where the waste solder is collected should be cleaned as often as required with the large bristle brush. Also, the felt filter may restrict vacuum flow if not periodically cleaned or replaced. Cleaning the felt filter is accomplished by washing it in solvent. To prevent solder from clinging to the "S" Baffle and tube, the chamber and baffle should be very lightly coated with mineral oil or solder reflow oil. When reassembling, position the "S" Baffle just in front of the end cap baffle assembly leaving only sufficient space for the felt filter.

   NOTE: - The "S" Baffle should fit snugly inside the glass tube with no loose movement. Tension may be adjusted by bending it between your fingers. DO NOT ATTEMPT TO BEND BAFFLE WHILE IT IS IN THE CLASS CHAMBER. (See Page 1.14.0)

3. The Air Pump filters must be cleaned at regular intervals. This may vary with extent of usage and coating volatiles removed by extraction. Unplug Unit. Remove the cover of the Power Source. Unscrew the filter caps and clean them. Remove the dirty filters and wash them with solvent or replace them with clean filters.

4. If required factory overhaul can be made by PACE for a nominal fee.

5. CAUTION: - Do not attempt to lubricate or pass liquids through the pump. Pump should be kept dry.

D. HEATER REMOVAL, REPLACEMENT AND HEATER LIFE:

1. To remove the Heater Assembly, allow the heater to cool. Unscrew the three screws in the Heater flange which hold the Heater Assembly to the handle. Loosen the cord retaining screw at the cord end of the extractor.

2. Slowly remove the Heater from the handle by pushing the 3 wire cord through the handle from the baffle assembly end. DO NOT PULL THE HEATER ASSEMBLY ITSELF.

3. If Heater tube is blocked, use the small tip in the soldering iron to melt and remove the blockage. See Section on Vacuum Continuum where recommendation for Vacuum Continuum is 2 seconds.

4. If a replacement Heater is being installed, grasp the connector pin attached to the wire of the Heater Assembly with pliers. Ease each pin from its connector as the pins are tightly fitted.

5. Replace Heater Assembly by inserting pins into line cord connectors. Pull slack cord through handle and remount Heater Assembly to handle. Tighten line cord retaining screw. Be sure to use metal spacer between the flange and ground cord connection.

6. NOTE: - Heater life will be extended by following Temperature Setting Instructions. Using the recommended setting of 6.5 to 7 for most work while idling at a setting of 4 will significantly improve Heater life expectancy.

. TROUBLE SHOOTING:

If the SODR-X-TRACTOR won't work, check the following:

1. Are you in the proper Mode and Flow Rate setting?
2. Is Tip sufficiently hot?
3. Is Tip clear of obstructions. (Check with a component lead or piece of buss wire.)
4. Is the Heater Tube clear of obstructions?
5. Is the glass chamber properly seated on front seal?
6. Is rear seal in proper position so spring leading on front seal is working?

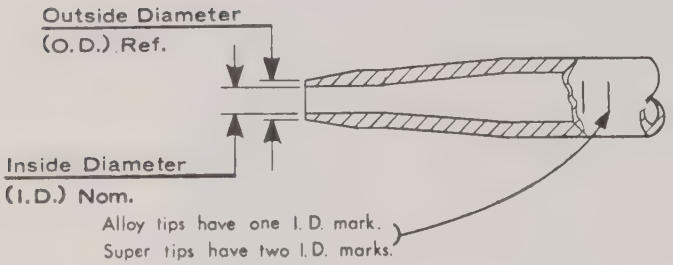
SODR-X-TRACTOR
REPLACEMENT PARTS AND TIPS

	DESCRIPTION	QUANTITY/UNIT	PART NO.
	SODR-X-TRACTOR Model SX-200	1	7010-0004
1.	Handle	1	4010-0024
2.	Tube Assy. w/male fitting	1	1325-0006
3.	Fitting, male	1	1263-0004
4.	Baffle & End Cap Assy.	1	4010-0031
5.	Chamber, glass	1	1265-0003
6.	Spacer, metal) order as kit	1	6993-0014)Kit
7.	Spacer, nylon) with items 12&13	2	6993-0014)
8.	Seal, .240 I.D., forward	1	1213-0008
9.	Seal Support	1	4010-0028
10.	Heater and Seal Assy.	1	6010-0013
11.	Washer) order as kit	3	6993-0014)Kit
12.	Screw) with items 7&8	3	6993-0014)
13.	Set Screw	1	1348-0285
14.	Tips (see chart below)		
15.	Brush, bristle	1	1127-0002
16.	Brush, wire	1	1127-0006
17.	Power Cord Assy.	1	1332-0009
18.	Clamps (not shown)	6	1211-0002
19.	"S" Baffle	1	4010-0033
20.	Seal, rear	1	1213-0001
21.	Filter, Sodr-X-Tractor	1	1309-0018

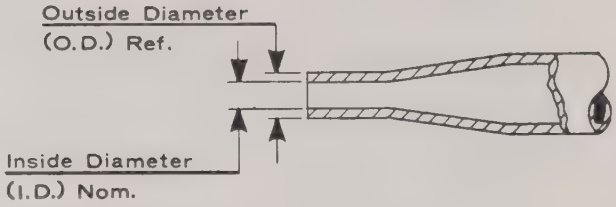
The new Series of Tips provides outstanding economy, due to wear characteristics many times better than the previous Type I, II and III Tips.

SODR-X-TRACTOR TIPS

SUPER & ALLOY



DOUBLE WALL



I. D. Nom.		O. D. Ref.		SUPER TIPS (Heavy Walled, Chamfered, Dual Clad, Copper)
Ins.	mm	Ins.	mm	PACE Part No.
.095	2.413	.125	3.175	1121-0091*
.061	1.549	.104	2.642	1121-0217
.050	1.270	.085	2.159	1121-0216
.036	.914	.072	1.829	1121-0215
.025	.635	.060	1.524	1121-0214
.018	.457	.053	1.346	1121-0213

*Not Chamfered

				ALLOY TIPS (Chamfered, Dual Clad)
.068	1.727	.125	3.175	1121-0115
.036	0.914	.072	1.829	1121-0117
.025	0.635	.060	1.524	1121-0118

				DOUBLE WALL TIPS (Dual Clad, Copper & Steel)
.057	1.447	.125	3.175	1121-0097
.036	0.914	.104	2.642	1121-0098
.025	0.635	.102	2.591	1121-0099

MINICHINE(TM) SYSTEM

PURPOSE:

The purpose of this system is to provide for the broad range of machining required in repair work. The unique spindle-shaft offers a primary piece of rotating machinery with a "pencil-like" fingertip controlled means for applying tools to the Workpiece through foot pedal sequencing. This permits working in confined areas, since it eliminates the need for minute and rapid frequency hand motions.

The unit applies High Torque, Low RPM and offers excellent control within a broad working range. With the use of Ball Mills, holes as small as 1/64" diameter nominal, can be made with a minimum of concern for the squareness of the Spindle to the Workpiece. On the other hand, the large 1/4" diameter ball mill routes a large amount of material in short order.

Some of its uses in Electronic Repair include:

a) Abrasive Removal of coatings.
b) Slitting inaccessible part leads.
c) Slitting parts, bonds and housings.
d) Routing coatings.
e) Removing standoffs and terminals without hole damage.
f) Drilling small diameter holes.
g) Milling, routing, abrasion, sawing, slitting, brushing, as required.

GENERAL.

The system consists of the MiniChine Spindle-Shaft shown in Fig. 1 which may be attached via the "Quick-Connect-while-Running" method. A set of tools has been provided for broad use of the system.

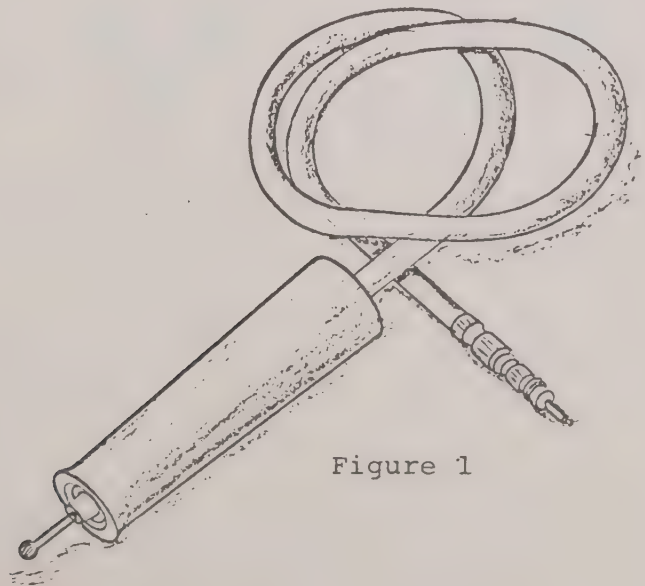


Figure 1

ATTACHING "QUICK CONNECT" MINICHINE SPINDLE-SHAFT.

Essentially, the NEW "quick connect" while running Spindle-Shaft consists of a flexible shaft with a Spindle at one end and male "quick connect" at the other end. The Spindle-Shaft may be inserted into the MiniChine drive outlet while the motor is running without causing damage to shaft or motor. The driving Torque is transmitted through engagement of the Shaft drive key and the MiniChine slot adaptor. Two detent grooves are provided at the shaft end which allow the shaft to be partially plugged in for an Idling Mode when the Spindle is not in use or may be fully inserted to the second detent groove for full engagement. (See Fig. 2.)

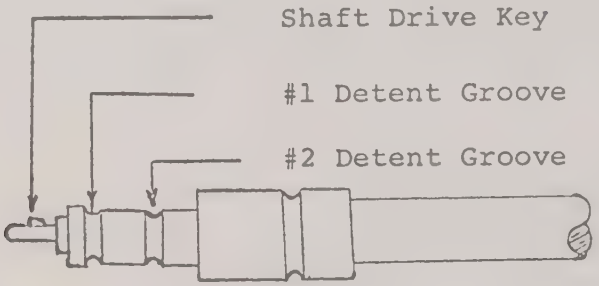


FIGURE 2

#1 Detent Groove is used for IDLE position of the Spindle-Shaft (Shaft does not rotate but is in a 'ready' position).

#2 Detent Groove is used to fully engage the Spindle-Shaft for MiniChining operations.

To engage the Flex Shaft to the Mechanical Power Output, select the desired operating sequence for the motor and energize, via foot pedal activation the drive causing the Slot Adapter to power rotate. Slide the Flex Shaft Key and Groove End into the Housing under light pressure until the Key engages the Slot Adapter, then continue to push the Groove end in until the spring-loaded ball engages the detent groove.

A few practice tries at engaging and dis-engaging will provide a feel for this action. Note how little pressure is required to engage the Key and Slot (Idle Mode) while heavier pressure is required to engage the ball detent locking action (Running Mode).

It may be desirable to initially determine what engagement looks and feels like. To accomplish this, DO NOT energize the Motor: look into the Mechanical Power Output and see the position of the Slot in the Slot Adapter, then hand-rotate the Drive Key Shaft so that its position will correspond, then insert the Key into the Slot without forcing, and observe relative position of elements. Now push Groove end in until Ball engages groove.

ATTACHING TOOLS TO THE SPINDLE.

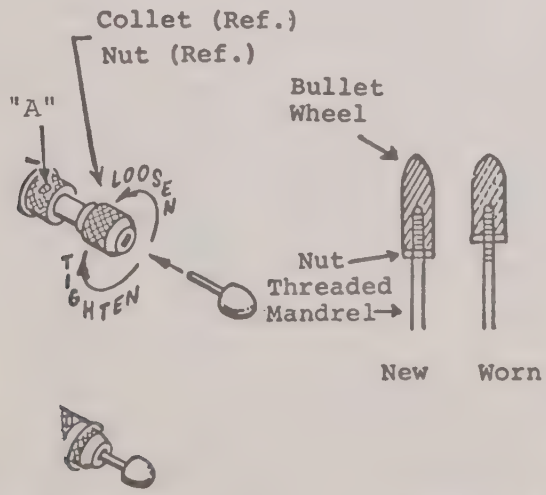
Basically, the Tools that are attached to the Spindle are either permanently or temporarily mandrel-mounted. (See Fig. 4.) The procedure for attaching these to the Spindle (see Fig. 3) is as follows:

1. Slide sleeve back until it is stopped by Rear Screw Detent.

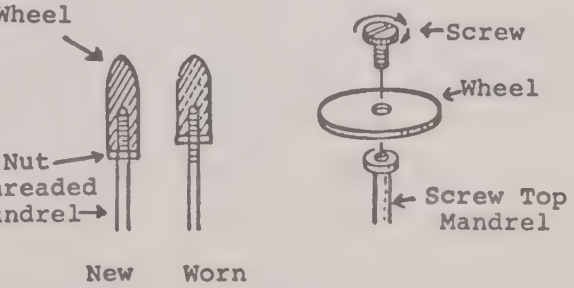
2. Loosen collet nut in the direction as noted, while reacting rotation by holding at surface "A". Loosen enough so that the mandrel will slide in easily and insert mandrel to depth desired.

3. Tighten collet nut in the direction as noted while reacting rotation at surface "A".

4. Slide sleeve forward until it is stopped by Front Screw Detent. NOTE: - In most cases, simple hand tightening will be satisfactory when using small diameter tools. However, when using larger diameter tools, and in other cases where extra tightening is required, any of the supplied mandrels will fit hole "A" and permit a lever action to give an extra tightening effect.



ATTACHING TOOLS TO SPINDLE
Figure 3

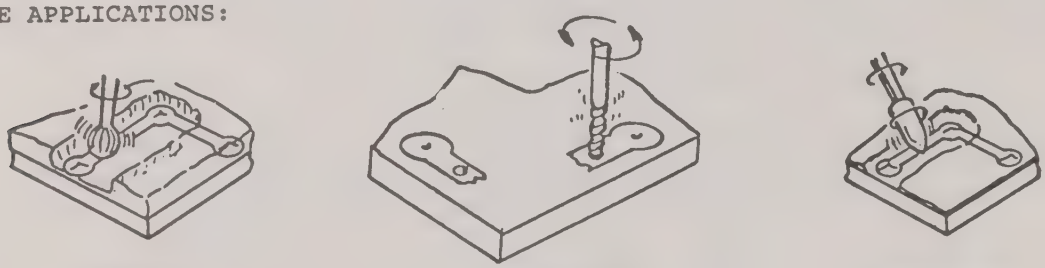


MOUNTING TOOLS ON MANDRELS
Figure 4

MOUNTING TOOLS ON MANDREL.

Fig. 4 shows the two basic mandrels supplied with the system and the corresponding tool mounting method. The threaded Mandrel is used for Bullet Wheel abrasives and other types of tools that will thread on the mandrel. The nut provides an adjustable base support and lock-nut effect whose position should be changed to compensate for the abrasive wear down. The Screw Top Mandrel is for all types of wheel shapes that are mounted on a through center hole basis. The friction load of the screw head drives the wheel and permits slippage under heavy load.

SOME APPLICATIONS:



ROUTING DRILLING ABRASION

Figure 5

TOOLS.

The basic Tool set provided (see Fig. 6) includes a variety of rubberized abrasives, ball mills, twist drills, slitting and slotting saws,

Rubberized Abrasives:

Bullet	Tapered	Wheel
(a) F	(c) F	(e) F
(b) C	(d) C	(f) C

(F-fine, red; C-coarse, green)

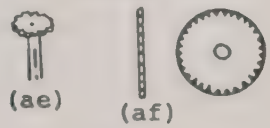
Ball Mills:

Part #	Nom."D"
(g)	1/64
(h)	1/32
(i)	3/64
(j)	1/16
(k)	3/32
(l)	1/8
(m)	5/32
(n)	3/16
(o)	1/4

Twist Drills:

Part #	Nom. "D"
(p)	1/32
(q)	3/64
(r)	1/16
(s)	5/64
(t)	3/32

Saws:



Abrasives Mounted & Un-mounted:

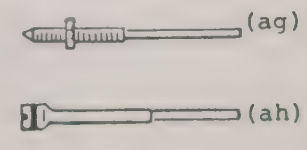
(u) L	(w) L	(y) L
(v) H	(x) H	(z) H

H-Pink Color; Harder metals
L-White Color; Soft metals

Brushes:

(aa) (ac)
(ab) (ad)

Mandrels:



Drill Stand - (ai)
Wheel Stand - (aj)

Figure 6 TOOL SET

mounted and unmounted abrasives, mandrels, brushes, stands, etc. The range of application of these tools is broad and limited only by the ingenuity of the user. (CAUTION: - The use of the slitting saw harbors the same bodily harm potential as any unguarded rotating saw blade. This device should be used only under light loads and with extreme caution.)

LUBRICATION, MAINTENANCE, AND CAUTIONS.

Maintenance requirements for the system are relatively nominal. Try to keep the unit reasonably clean to prevent dirt and chips from entering the Spindle and Shaft Assembly.

a) Should the Shaft Assembly develop a vibration, apply a few drops of light oil in the space between the Drive Key Shaft and the Groove End (see Fig. 2) while holding the Assembly on end so that the oil will travel down inside the Sheath.

b) The Spindle should be lubricated approximately every ten operating hours, or at least every six months by removing Screw A (see Fig. 3) and applying two or three drops of light oil at this point.

c) When running the unit, try to keep the shaft bends gradual rather than sharp.

Other Uses:

The High Torque, Low RPM drive can operate other Function Accessories or Systems; i.e., Vibra/Probe, etc.

TO OBTAIN THE MAXIMUM USE POTENTIAL OF THE SYSTEM, FAMILIARIZE YOURSELF WITH THE VARIOUS TOOLS AND THEIR OPERATIONAL FEEL IN VARIOUS APPLICATIONS

NOTE: - To prevent overheating of the SODR-X-TRACTOR handle when using the MiniChine System, reduce the voltage control to 4 on the reference scale and either disconnect the air supply hose from the Vacuum outlet or place air hose on the Pressure Outlet. This will also increase the life span of the Heating element and X-TRACTOR tips.

Item	New Part #	Description	Remarks
System	7005-0005	Min. Machining System	Complete
(1)	6005-0007	Spindle-Shaft Assy.	
	4005-0001	Nut, Knurled	Ref. Spindle Assy.
	4005-0002	Collet 3/32"	Ref. Spindle Assy.
(2)	6005-0003	Tool Set	
(a)	1129-0007	Bullet Abrasive Fine, Red	Ref. Tool Set
(b)	1129-0008	Bullet Abrasive Coarse, Green	Ref. Tool Set
(c)	1129-0004	Taper Abrasive Fine, Red	Ref. Tool Set
(d)	1129-0003	Taper Abrasive Coarse, Green	Ref. Tool Set
(e)	1129-0001	Wheel Abrasive Fine, Brown	Ref. Tool Set
(f)	1129-0002	Wheel Abrasive Coarse, Green	Ref. Tool Set
(g)	1112-0001	Ball Mill 1/64"	Ref. Tool Set
(h)	1112-0002	Ball Mill 1/32"	Ref. Tool Set
(i)	1112-0003	Ball Mill 3/64"	Ref. Tool Set
(j)	1112-0004	Ball Mill 1/16"	Ref. Tool Set
(k)	1112-0005	Ball Mill 3/32"	Ref. Tool Set
(l)	1112-0006	Ball Mill 1/8"	Ref. Tool Set
(m)	1112-0007	Ball Mill 5/32"	Ref. Tool Set
(n)	1112-0008	Ball Mill 3/16"	Ref. Tool Set
(o)	1112-0009	Ball Mill 1/4"	Ref. Tool Set
(p)	1112-0031	Twist Drill 1/32"	Ref. Tool Set
(q)	1112-0032	Twist Drill 3/64"	Ref. Tool Set
(r)	1112-0033	Twist Drill 1/16"	Ref. Tool Set
(s)	1112-0034	Twist Drill 5/64"	Ref. Tool Set
(t)	1112-0035	Twist Drill 3/32"	Ref. Tool Set
(u)	1129-0011	Abr. Mtd. White	Ref. Tool Set
(v)	1129-0012	Abr. Mtd. Pink	Ref. Tool Set
(w)	1129-0009	Abr. Wheel Mtd. White	Ref. Tool Set
(x)	1129-0010	Abr. Wheel Mtd. Pink	Ref. Tool Set
(y)	1129-0005	Abr. Wheel Un-Mtd. White	Ref. Tool Set
(z)	1129-0006	Abr. Wheel Un-Mtd. Pink	Ref. Tool Set
(aa)	1127-0005	Brush Un-Mtd. 9/16"	Ref. Tool Set
(ab)	1127-0010	Brush Un-Mtd. 3/4"	Ref. Tool Set
(ac)	1127-0007	Brush Mtd. Bristle	Ref. Tool Set
(ad)	1127-0008	Brush Mtd. Brass	Ref. Tool Set
(ae)	1112-0061	Saw, Slotting 3/32"	Ref. Tool Set
(af)	1112-0062	Saw, Slitting 3/4"	Ref. Tool Set
(ag)	1115-0002	Mandrel	Ref. Tool Set
(ah)	1115-0001	Mandrel	Ref. Tool Set
(ai)	6019-0002	Drill Stand	Ref. Tool Set
(aj)	6019-0003	Wheel Stand	Ref. Tool Set

THERMOPART UNIT #TP-15

PRINCIPLE:

This unit is primarily intended to provide efficient and controllable Thermal Parting and De-soldering capabilities for a broad variety of Workpiece configurations. Many people have attempted to accomplish Thermal Parting by thinning down a normal soldering iron tip. This has met with very limited success due to the fact that the iron tip transmits heat via conduction, and the thinned down tip has neither sufficient thermal capacity nor does it allow for proper control with which to accomplish the task effectively.

Essentially, the PACE ThermoPart Unit utilizes a variety of "quick connect" interchangeable blades which are designed to act as heat generators and mechanical work elements. The fact that the heat is generated "on demand" in the blade, permits the use of thin blade sections while still providing sufficient thermal capacity to maintain heat levels during the work action. Further, we are able to control blade operating temperature ranges to suit specific parting problems. The term "blade" in no way means to infer a sharp cutting edge but in all instances we are dealing with a true thermal parting (NOT CUTTING) procedure.

BLADE CONFIGURATION AND CHANGEOVER:

Since the blades are readily changed in a matter of seconds, due to rapid cool down, a series of blade shapes can be used to suit the many Workpiece parting configurations we may have to deal with. In actual practice it may be necessary to use two or three different blade shapes in sequence to part a component out of the conformal coating holding it in position.

BLADE HOLDER:

The blade holder is a "pencil-like" device that provides the manipulative control over the blades as well as feeding them with controlled electrical power from the Power Source. The connector block is color-coded "Green." (See Fig. 1.)

BLADES:

Each blade is mounted to a set of pins which plug into the blade holder making it a simple matter of switching from one blade configuration to another. The blades cool down in a matter of seconds once the electrical power is removed from them, due to their small thermal mass and special alloy material which easily gives up residual heat.

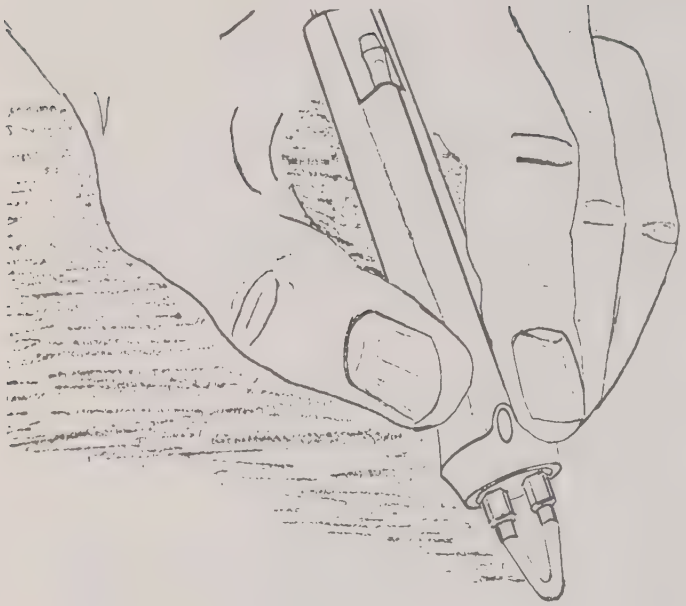


Fig. 1

STRAIGHT "V"
6000-0009
Standard

90° "V"
6000-0020
Optional

RADIUSED
6000-0022
Optional

Fig. 2

BLADE SELECTION AND USE:

The straight "V" blade supplied with your unit will suit most of the Thermal Parting requirements. This blade can be easily modified with a 90° bend when necessary. The other blades are available to suit unusual circumstances. (See Fig. 2.)

Blades may be heated to high temperatures (visible red glow) but should not be left ON for more than 10 seconds maximum at these temperatures and then shut down for cool off. You will find this 10 second range is more than adequate for any high temperature usage of the blade. At low temperatures the blade may be heated for much longer periods of time and in most cases, continuously, if necessary.

MAINTENANCE:

This unit requires little or no maintenance except for cleaning the blades during use with the brush provided with the PACE Cleaning Unit.

DUTY CYCLE:

The unit may be operated continuously at low temperature levels but should be worked no longer than 10 seconds at dull red heat and then allowed to cool down for 5 to 10 seconds.

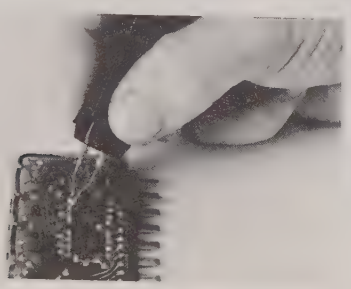
USES.

Parting on Component Side of a Circuit Board:

One of the primary uses for the unit is in parting conformal coatings between the components and between component leads and their mounting surfaces. It is also used to release the bonds between the component body and the board, as well as to thin down any thick coating from the surfaces of the board.

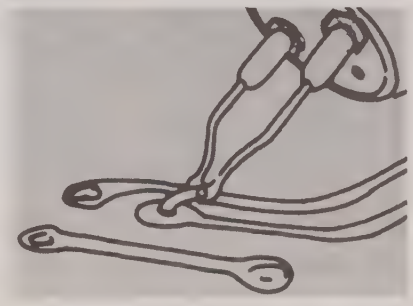
Parting on the Printed Wiring Side of a Circuit Board:

The removal of thin coatings from the printed wiring side of the board or the non-component side of a double-sided circuit board should be accomplished with the PACE MiniChine System via the abrasion method since this is the most precise method of removal and there are no vertical encumbrances to prevent the use of abrasive wheels. Thick coatings should be thinned down with the Parting Unit prior to using abrasive removal methods. (See Fig. 3.)



Epoxy conformal coating removal. Application of controlled heat via alloy tip thermally degrades conformal coating for fast, safe removal.

Fig. 3



Clinched D.I.P. and other difficult to handle leads can be easily and safely unclinched.

Fig. 4

De-Soldering:

The blades may be elevated to solder melting temperature levels. By proper heat setting and manipulation, clinched leads can be de-soldered and unclinched prior to Sodr-X-Traction when it is desirable to save the original component or lead length. (See Fig. 4.)

Conformal Coatings and Thermal Parting:

There are literally hundreds of different types of conformal coatings. They range from simple varnishes to two-part epoxy materials of extreme hardness. The softening or breakdown point (point at which Thermal Parting occurs) will vary with the specific coating to be parted.

Whenever the "softening point" is below solder melting temperatures, we have an ideal situation and need not concern ourselves with solder joint re-melts but must still try to work rapidly so as to limit the heating of the component involved. When the "softening point" is equal to or above the solder melting point, we must be concerned with the specific application of heat in solder joint or component areas and the rapidity of parting the coating to limit the total heat being applied.

There are classes of thin conformal coatings with a "softening point" close to the "softening point" of the epoxy glass circuit board itself. On these coatings, the level of heat we must apply can readily damage the circuit board itself and destroy components due to overheating.

In these instances, particularly when we are dealing with single-sided boards, use the PACE MiniChine System with the small ball mills or slitting wheels to part the coating mechanically, then break up the component and mechanically remove the small pieces. When double-sided boards are involved, the slitting wheel method can cut into the circuitry and should be used in a very limited manner by cutting to shallow depths then breaking up the component and mechanically removing the pieces. Clean up residual coating material by abrasive procedure.

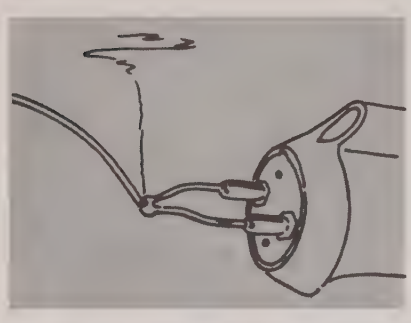
The thermal parting unit can be used with these high "softening point" coatings if the coating is thick and the heated blade is controlled so that it does not contact the board surface directly.

SETTING UP:

Attach the universal power cord female plug to the ThermoPart Hand-piece and the male plug to the Power Source. Sequence the Source so that the Electrical Output is controlled by the Foot Pedal.

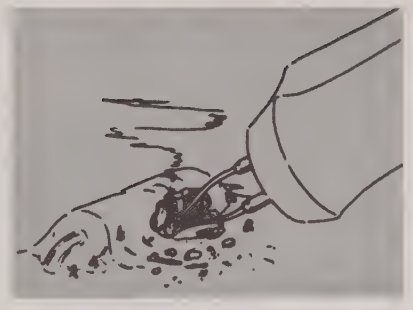
Set the Power Increase knob to the lowest level and bring the blade in contact with a small sample of the coating to be parted by applying the blade, under light pressure, to the coating itself. Depress the Foot Pedal to power the blade and slowly increase the Power Increase knob until the blade sinks into the coating or the coating readily breaks down. (NOTE: - There should be no scorching or smoke generated: if so, the blade is too hot.) This establishes the approximate temperature level (note reading of the dial position for reproducing settings) for the coating.

One thing to keep in mind is that even though the blade cools off rapidly, if power is applied on a rapid cycle basis with extremely short cool off time, the residual heat in the blade, plus the new flow of electrical power will cause the blade to rise to higher temperature levels. This is not detrimental since we should be using the "Work-piece Indicator" concept and will be observing the rate at which the coating is parting. Therefore, should the blade rise in temperature, it will part the coating more rapidly and we should move the blade faster to compensate for the change in blade temperature. Under no circumstances should the blade temperature be set so high as to cause scorching or smoking.



Adjust heat for scorchless operation. Proper temperature for epoxy removal will just melt solder held against heated tip. Use this method as an aid for heat setting selection.

Fig. 5

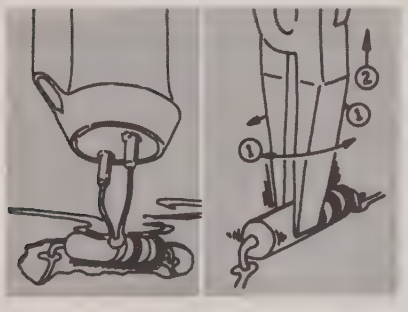


Apply tip to coating with light pressure, depress foot switch. Epoxy should granulate, Poly-U soften. Pulse heat for fine control.

Fig. 6

Remove bulk of coating around component. Use slow, rubbing motion. Don't go too deep. Extract solder.

Fig. 7



To soften bond, apply increased heat to component body. Twist and lift the component free. Clean up under component carefully.

Fig. 8

Connect Power and adjust Heat. Locate tip for unclinching. Apply heat.

Fig. 9

The ThermoPart tip unclinching lead Heat until solder melts, lift lead from sur face. DO NOT PRY or Pad will lift.

Fig. 10

Figures 5 through 10 above illustrate the ThermoPart Unit in action.

(WITH A LITTLE PRACTICE, THIS UNIT WILL BE WORTH ITS WEIGHT IN GOLD FOR REPAIR PROBLEMS.)

CAUTION: DO NOT ACTIVATE ELECTRICAL POWER WHILE ATTACHING UNIT TO UNIVERSAL CORD, OR UNIVERSAL CORD TO POWER SOURCE!

PARTS LIST

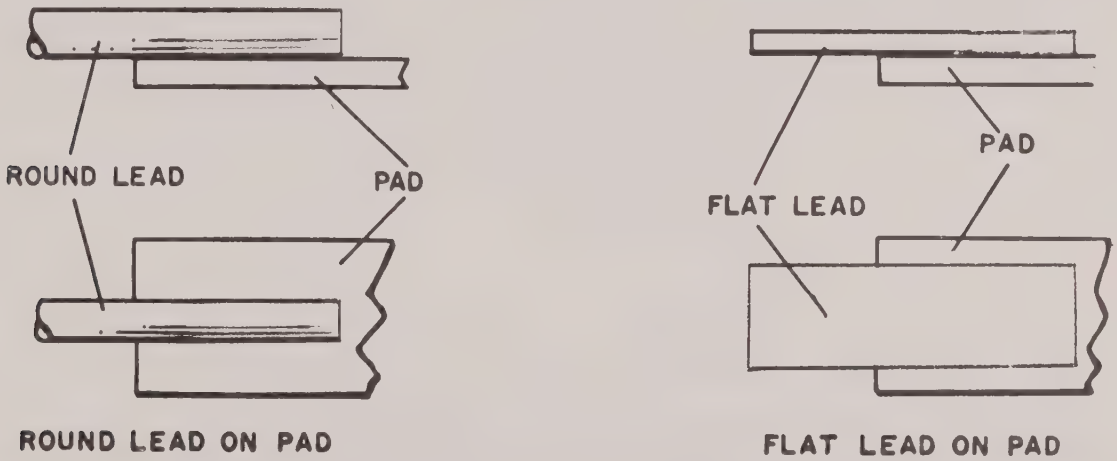
Item	Description	Part No.	Remarks
System	TP-15 ThermoPart	7013-0004	Complete
(1)	Blade, Straight "V"	6000-0009	Standard
(2)	Blade, 90° "V"	6000-0020	Optional
(3)	Blade, Radiused	6000-0022	Optional

LAPFLO SOLDERING SYSTEM

PURPOSE:

A large percentage of the round and flat leads used in Micro-Electronic construction terminate at a "Lap Joint" (see Fig. 1). To make a High Reliability Soldered Lap Joint requires somewhat different soldering techniques than those normally used.

The PACE LapFlo Soldering System is specifically designed to produce and repair High Reliability "Lap Joints."



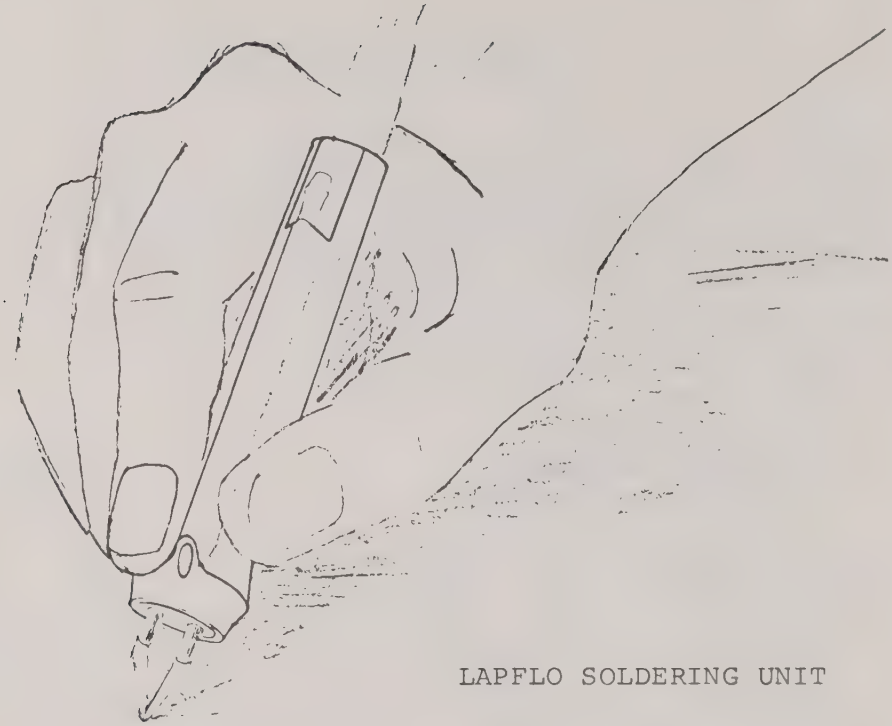
LAP JOINTS

Fig. 1

PRINCIPLES OF THE PACE LAPFLO SYSTEM:

The PACE LapFlo Soldering System (see Fig. 2) can be classified as a composite of Conductive and Resistive heating method. Essentially, the primary working element is a Tip which is shaped and contoured to suit Lap Joint configurations. The Tip Element acts as a heat generator and also conducts the heat into joint to be soldered. Pressure controlled clamping of the lead to the pre-tinned pad is also provided by the Tip Element.

Attach the Universal Power Cord female plug to the LapFlo Handpiece and the male plug to the Power Source. Sequence the Source so that the Electrical Output is controlled by the Foot Pedal.



LAPFLO SOLDERING UNIT

Figure 2

The Tip Element in the unheated mode clamps the cleaned lead against the pre-tinned pad. A controlled current is then passed through the Element, causing it to resistance heat. The generated heat is conductively transmitted to the lead and tinned pad causing the solder on the pad to re-flow and bond the lead to the pad. (NOTE: - All of this occurs while clamping pressure is maintained.)

The action is observable to the operator who can easily react to the formation of the proper solder joint by switching off the resistance heating action while maintaining the Element in the clamped position to stabilize the joint during cool down. Cool down is accelerated as the Element in the unheated mode acts as a heat sink and aids in cooling the joint. Tip Elements are replaceable via "quick connect" means. NOTE: - The connector block is color-coded Red for easy identification.

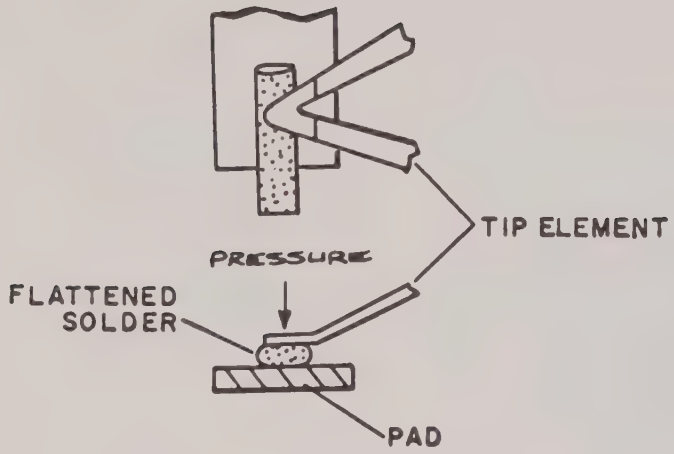
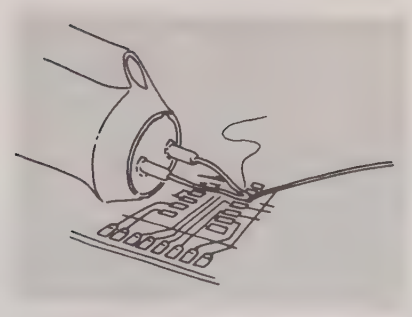


Figure 3



Pre-Tin pad. Position solder on pad. Tip on solder. Depress foot switch. Remove tip when solder flows.

Figure 4

To prepare any Workpiece for Lap Joint soldering, proceed as follows:

a) Remove any old solder by Sodr-X-Traction or Wicking technique.
b) Thoroughly clean the pad surface with a fine rubberized abrasive stick so that the pads are shiny bright.
c) Clean area with PACE solvent or equal to remove any abrasive particles or oil.
d) Apply a very light coating of thinned liquid flux.
e) With the LapFlo Soldering Unit set-up, as previously described, lay solder on the full length of the pad and apply the flat of the Element in the middle of the pad so that the solder is clamped to the pad. (See Figs. 3 & 4.) Use sufficient pressure so that a slight downward movement of the handle assembly is noted.
f) Apply heating power by energizing foot switch and observe the flow of the solder. If the solder doesn't melt rapidly and flow out on the pad with good wetting action, increase the power a little at a time until the proper flow and wetting action is obtained, but stay within the limits of your reaction time to avoid overheating.

g) Once the proper setting has been established, you can proceed tinning the pads. NOTE: - The PACE technique permits a re-heat of the same pad until the proper heat setting is established. This suits the nature of repair or rework in which a setting may have to be established for a single repair and no sample specimens are available for the specific set-up, thus, the actual Workpiece can be used without damage. CAUTION: - Always allow time for cool down of a pad before reheating it in order to prevent damage.

Component Preparation. Apply flux to pads and lead. Pre-position component.

Figure 5

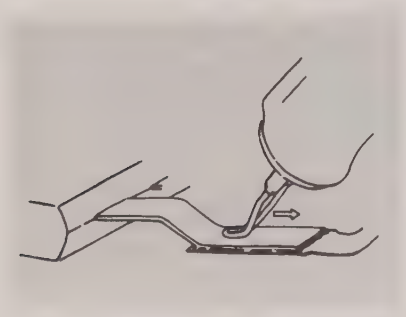
LEAD PREPARATION AND SOLDERING:

Trim and pre-form the leads as required to suit the specific assembly so that no loading is established at the seal points during lead forming and soldering. Clean the flat or round leads to be soldered and pre-flux them. Apply PACE flux or equal to all surfaces of leads to be soldered.

Lay the leads on the pre-tinned pad, making sure the package function is properly oriented and the leads correspond to the proper grouping of pads.

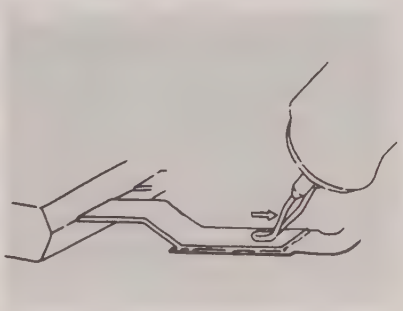
With the Power set at the levels used for tinning, apply the flat of the Element over the center of the pad so that the lead is clamped to the pad by noting a slight downward movement of the handle assembly.

(See Figs. 6-8.) Activate the Power and observe the formation of the soldered Lap Joint. If the solder does not reflow sufficiently, increase the heating levels slowly and re-heat the Lap Joint until the desired reflow action is noted. Always maintain the Element in contact with the Workpiece during heat up as well as cool down. This will stabilize the Lap Joint, as well as accelerate the cool down process.



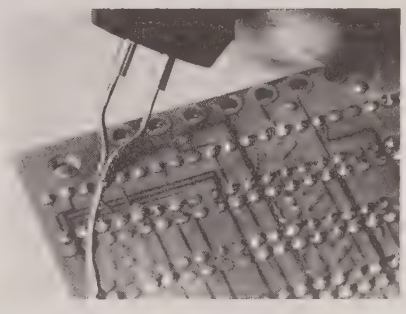
Solder Component in place. Place tip on lead. Depress foot switch. Slide tip 1/64" to 1/32" towards end of lead when solder flows.

Figure 6



Release foot switch. Hold tip motionless with light pressure on lead until solder cools.

Figure 7



LapFlo soldering jumper in place on multilayer printed circuit board. The Heating/Clamping action of the LapFlo tip allows undisturbed soldering of No. 26 Teflon-insulated jumper to D.I.P. lead.

Figure 8

The procedure just described is ideally suited to repair since the same Lap Joint can be reheated a number of times until the proper power settings have been established. Consequently, if no specimens are available this procedure can be accomplished on the actual Workpiece. CAUTION: - Always allow time for cool down of a Joint before reheating it, to prevent damage.

FLAT PACK MOUNTING:

Flat packs may have 10, 12, 14 or more leads. When mounting the pack be sure to orient for function and be sure the leads and pads coincide. Start by re-flowing leads #1 and #14 or any pair of extreme diagonals to positively anchor function orientation and prevent lead slippage.

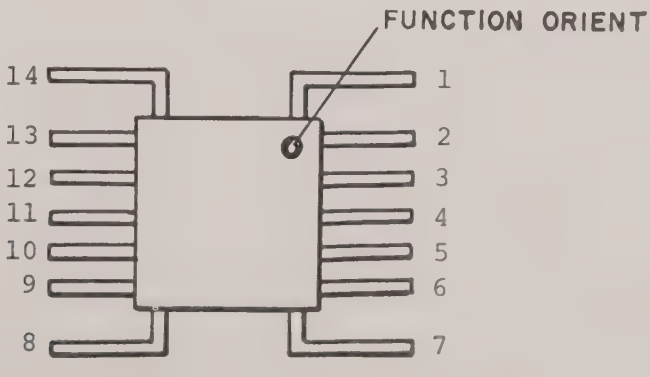


Figure 9

REMOVING LEADS:

Welded in Leads: If it is required to remove a part in which the leads have been welded to the pads, the only means available that will not damage the pads is to cut the lead as close to the pad as possible. CAUTION: - Make sure the cutting action does not apply a pulling load to the pad.

Mount the new lead using a soldered Lap Joint over the remaining double thickness of the old welded Lap Joint.

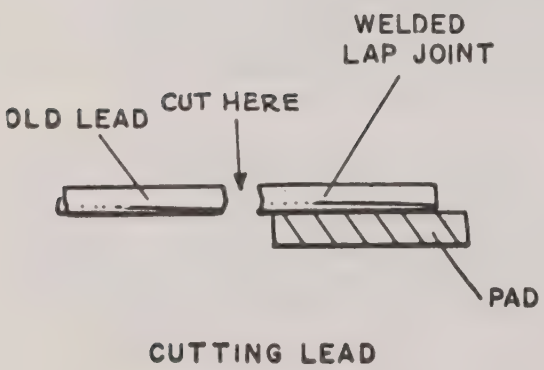


Fig. 10

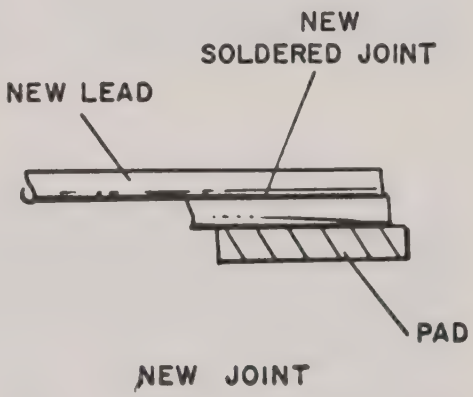


Fig. 11

LIMITATIONS OF THE SYSTEM:

This Miniature Soldering System is ideally suited to working on all types of epoxy-based substrates. However, it is not suited to the "ceramic type of substrate" due to the extreme heat sinking qualities of the ceramic. Information is available upon request for another type of PACE system suited to working Ceramic Substrates.

MAINTAINING THE SYSTEM:

The system requires very little maintenance. Keep the Tip Element clean as flux residue will build up and reduce heating efficiency. Maintain the Tip Element as a regular soldering iron tip.

Parts List

Item	Description	Part No.	Remarks
System	Lap Reflow Soldering Kit	7022-0003	Complete
(1)	LapFlo Handpiece	6022-0002	
(2)	LapFlo Tip, Std.	6000-0008	
(3)	LapFlo Tip, Miniature	6000-0025	Optional
(4)	LapFlo Practice Package	6030-0005	

CAUTION: - DO NOT ACTIVATE ELECTRICAL POWER WHILE ATTACHING UNIT TO UNIVERSAL CORD, OR UNIVERSAL CORD TO POWER SOURCE.

SPECIAL AIDS

*Pro/Vise: This unit provides for "quick interchange attachment" of flat, square and cylindrically shaped tip elements. Each unit is provided with a set of six "Cutter Tips" including flat, square and cylindrical shank shapes. The unit is compatible with the complete set of tools provided with the PACE MiniChine System.

Hot Cubby System W/Cleaning Unit:

This consists of a detachable unit containing two Hot Cubbies capable of holding under adverse conditions both the SODR-X-TRACTOR and Soldering Iron at their maximum operating temperatures of up to 1000°F. A Solder Dump Device is included which can receive molten solder under high velocity without danger to the operator or equipment. The Cleaning Unit provides for both non-contaminating brushing and wet sponge cleaning of SODR-X-TRACTOR and Soldering Iron Tips.

ComForm I: This unit provides the composite capability of pre-measuring the required hole-to-hole spacing and forming axial lead components to fit the desired spacing for Vertical or Horizontal mountings with or without Stress Relief loops. Straightening and Reforming of TO-5 and TO-18 Transistor leads is included. All forming, spacing and bends meet the most vigorous specifications.

PRO/VISE

HOT CUBBY SYSTEM

COMFORM I

Component Forming Procedure with the ComForm I:

One of the major causes for deficient repairs is found in forming the leads of the replacement part to match the available hole spacing. This is particularly true of semi-conductor devices where the seals can be easily damaged, causing either immediate failure or future failure under thermal cycling or vibration. It is, therefore, essential that Component Lead Forming procedures be established on a controlled basis to avoid seal strain.

In order to control the Lead Forming operation, to assure reliable repairs, a component forming device is provided which will:

Measure the hole-to-hole spacing and form the component leads with the proper bend radii and body seal to bend distance to suit the mounting hole spacing.

Eliminate the possibility of straining component body seals during lead forming.

Permit the formation of stress relief loops without straining component seals, while providing the desired lead-to-lead dimension to suit the available hole spacing.

Permit measuring and forming leads for both horizontal and vertical component mounting to suit available hole spacing.

Provide for straightening of transistor leads to suit standard hole spacing with length trimming gauge.

These capabilities are possible with the single tool whose utilization is illustrated in Figs. 1A thru 1E.

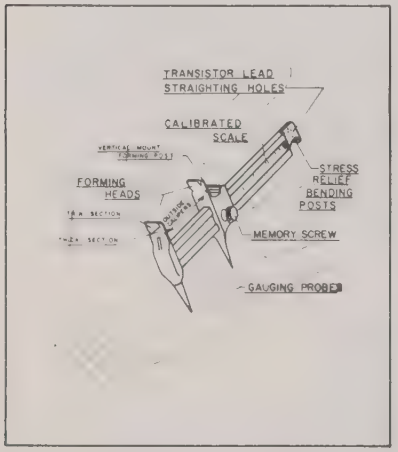


FIG. 1A. Nomenclature of component forming unit

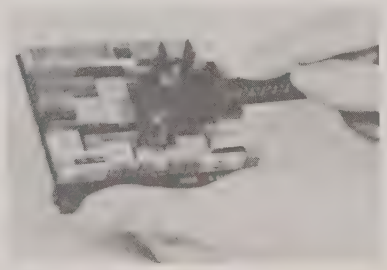


FIG. 1B. Measuring the hole to hole spacing to set the forming heads prior to forming the leads

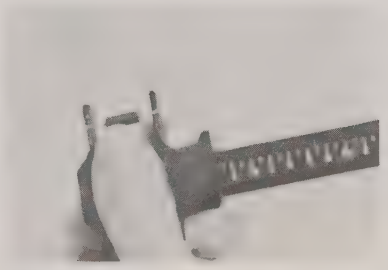


FIG. 1C. Forming the 90° bends with desired lead spacing for horizontal mounting

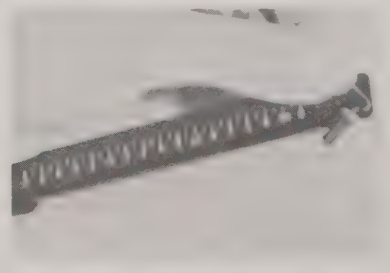


FIG. 1D. Forming the stress relief loops with desired lead spacing

FIG. 1E. Forming the 90° bends with desired lead spacing for vertical mounting

PARTS LIST

Description	Part No.	Remarks
SPECIAL AIDS KIT #T-450	6993-0032	Complete
Pro/Vise w/cutting tools	7016-0003	Complete
Hot Cubby System & Cleaning Unit	6019-0011	Complete
Cleaning Unit Assembly	6021-0001	
a. Cap	1313-0007	
b. Brush	1127-0012	
c. Sponge	4021-0001	
ComForm I	6016-0003	Complete

CONDUCTWEEZ SYSTEM

PURPOSE:

This unique system provides a capability that has never been available heretofore, and offers capabilities which cannot be accomplished by Resistance heating methods. Most people are familiar with Resistance Tweezing techniques which generate heating by transmitting high current through the Workpiece. Although the method offers high speed and localized heating, it sometimes causes arcing effects due to varying contact resistances, and, most essential, it can cause damage to some electronic components, due to the current surge through the Workpiece.

Another disadvantage of Resistance Tweezing is the difficulty of controlling power levels, since slight changes in contact resistance will cause major changes in current flow, or a slight increase in dwell time can blow the Workpiece. Its control factors, in many cases, are beyond human reactive time.

The Conductive Tweezing System overcomes all the deficiencies of the Resistance Tweezing method. ConducTweez utilizes a pair of pulsed, heated electrodes that transmit the heat into the Workpiece by conductive means, thus entirely eliminating current flow in the Workpiece and the possibility of arcing.

The ConducTweez method also provides a far broader control range since slight changes in dwell time or power levels will not damage the Workpiece. Control factors for the ConducTweez are well within human reactive time.

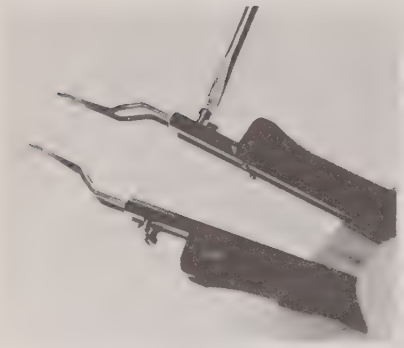
USES:

Cross Wire Soldering.

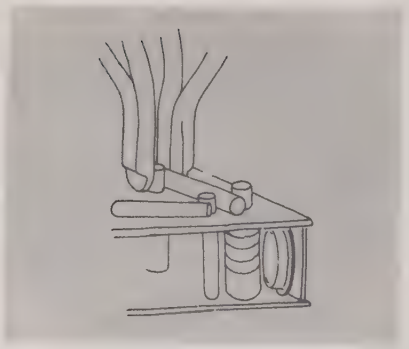
Attach the Universal Power Cord female plug to the ConducTweez Handpiece and the male plug to the Power Source. Sequence the Source so that the Electrical Output is controlled by the Foot Pedal.

In cases where the repair of broken cross wire welds are required; i.e., Flat-to-Round or Round-to-Round, pre-clean and flux the areas to be soldered. Grip the two pieces to be joined with the ConducTweez (while cold,) when grip stability is established, pulse heat the ConducTweez electrodes and feed cored solder into the areas to be soldered. When sufficient solder has flowed into the joint, stop the pulse heating and maintain clamped condition while the joint cools down. (Use air flow for accelerated cool down.)

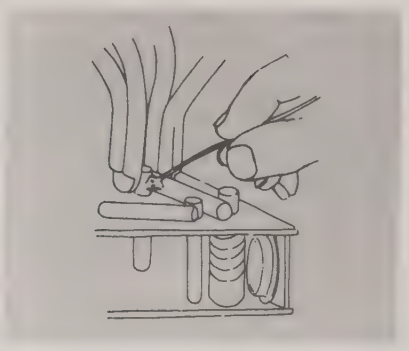
NOTE: - The time cycle for the first joint made will be longer than that for succeeding joints due to residual heat in the electrodes. Therefore, use "heat rate recognition" methods for changing the dwell time to suit the variations in heating conditions. This is basically the same technique employed with an ordinary soldering iron.



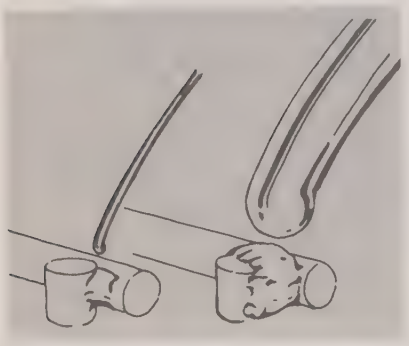
Be sure tip-retainer screws are tight. Connect Power Cord.



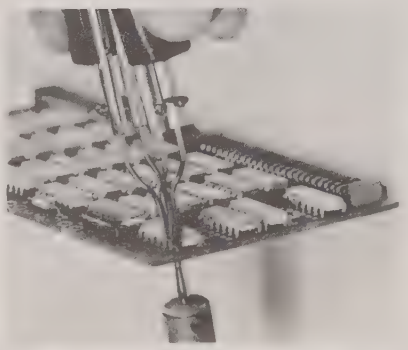
Grip work with tips and depress foot switch to heat work.



Apply required solder, release foot switch. Keep work clamped until solder cools. Carefully cleaned, pre-fluxed surfaces render high reliability solder joints.

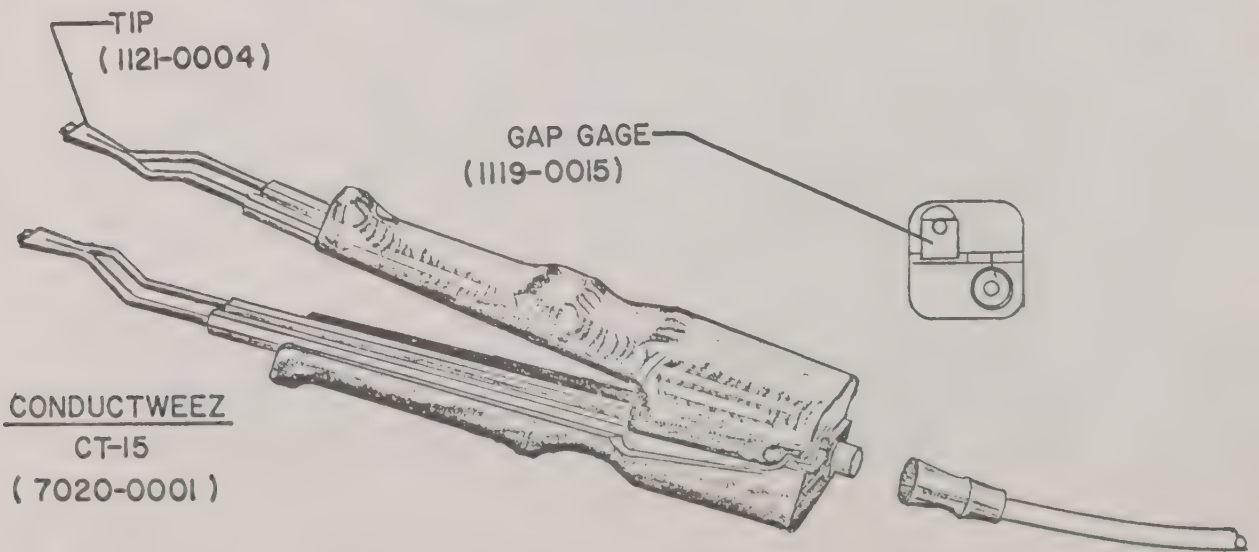


Large solder. Small solder. Use smaller Dia. solder to decrease buildup at junction.



Use ConducTweez for controlled auxiliary heating for solder extraction operations.

Modified tips safely remove monolithic capacitors from thick film ceramic printed circuits.



Withdrawing "Soldered-In" Clipped Leads:

Grip the pre-clipped lead between the cold electrodes while making sure that the end of the electrodes are in contact with the solder joint, itself. Apply pulse heating and observe solder joint melt, allowing sufficient time for melting through a plated-thru joint. When lead feels free by stirring or oscillation indication, withdraw the lead. Clean the area using Solder Extraction techniques.

Other Uses:

The application of this device is only limited by the imagination of the user. Soldering, De-soldering, Unbonding Components, Conformal Coating Removal are only a few of the areas of usage.

Setting Temperature Levels:

Essentially, the Power levels of the unit should be set so that the electrodes, with residual heat, will be able to either make or melt a solder joint within 2 to 3 seconds. Only a few minutes of practice will get you there on a consistent basis.

CAUTION: Always set your Power Control to very low levels and work up to the proper setting. Too high a Power setting will burn the electrodes.

CAUTIONS: The unit is designed for the cyclic application of heat to the tips. Under no circumstances should heat be continuously applied to the tips for more than 90 seconds, as they will degrade rapidly with an extended Red Hot condition.

Maintenance:

Keep the electrode gripping surfaces clean with fine abrasive paper for maximum heat transfer.

PARTS LIST

Item	Description		Remarks
System	#CT-15 ConducTweez	7020-0001	Complete
(1)	ConducTweez Tip	1121-0004	

ENVIRONMENTAL PROBE

PURPOSE.

This unit provides the means for isolating heat-caused intermittent failures by placing discrete parts under controlled environmental conditions. The System permits thermal loading of a suspect part without damage to the part or its surroundings. In addition, the unit provides the means for: a) Rapidly drying localized areas before coating, b) accelerating the curing of protective coatings and bonding materials.

CONNECTING UP.

Attach one end of the Tubing Assembly to the rear of the Probe and the "disconnect end" to the Pressure side of the Power Source.

Set Pressure Flow Control valve to Max. position and sequence Power Source for foot pedal activation of the Mechanical Output. Attach the Probe power cord to "Fixed AC" 115 VAC, 60 cycle electrical power outlet.

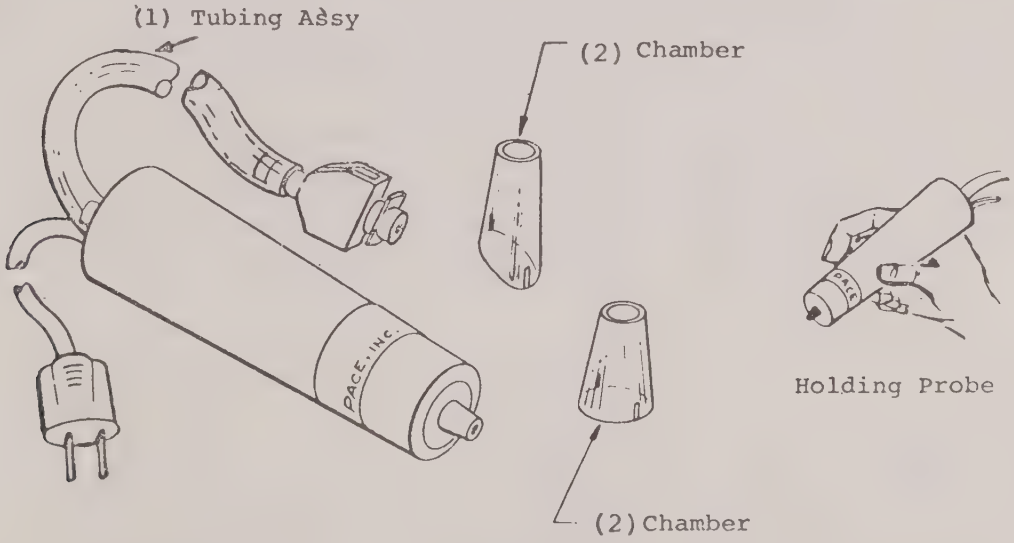


Figure 1

WARM UP.

Just as with any controlled environmental chamber, the Probe must be pre-heated and temperature stabilized before using. This can be accomplished very rapidly. To stabilize the unit: a) Switch on the electrical power only for a period of 30 to 45 seconds, b) With the electrical power still on, turn on the air supply and permit it to flow for a period of two to two and one-half minutes. The unit will now be ready for use. NOTE: - Should the unit or the Power Source have been stored at low temperatures (under 60 deg.F) permit the air to flow for an additional 30 seconds.

Once the warm-up procedure has been completed, it need not be repeated as long as the electrical power feeding the Probe is left on. If the air flow is turned off and the electrical power is left on, the Probe may be used at any time by simply turning the air flow back on for 45 to 60 seconds before using the unit. (NOTE: - The Probe temperature is self-controlling.)

CAPABILITY:

The unit will provide a supply of heated air controlled between 155-170 degrees F. (Note: - Other temperature ranges can be provided.) with this ability, plus the Chambers provided, it can establish environmental conditions or act as a drying and curing device.

ENVIRONMENTAL CONDITIONS:

If it is desired to put any part under controlled elevated temperature conditions, select the proper chamber to fit the part; i.e., round chamber or the slightly flattened chamber. Assemble the chamber to the Probe, place it over the part to be heated. (NOTE: - When mounting the chambers over delicate parts, such as Diodes, etc., try not to force them on but rather deform the chamber as required so that it can fit over the part and make a seal with the surface the part is mounted on.) "Note the slots in the chamber," these allow continuous air flow during part Heat Up as well as provide clearance for the part leads. To get a true environmental condition, the part to be heated must be in the chamber and not at its very edge. This prevents ambient air from mixing with the temperature-controlled air and creating a distorted temperature condition.

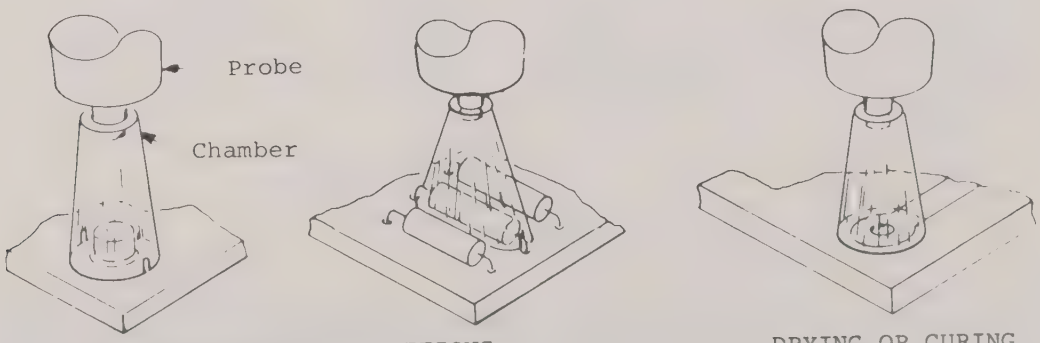


Figure 2

DRYING:

When using the probe as a drying device, the accuracy of the temperature control is not as important. In this case, either the chambers or the Tips which are provided with the PACE Vacuum Tweezer System may be used to apply the heated air to the area to be dried.

The Probe and Chambers are insulated and they may be applied to areas in which high voltage or current is present.

MAINTENANCE AND CAUTION:

There is very little maintenance required for this unit. It should, however, be treated with respect as it is an instrument deserving of your care. Do not drop or put any undue shock loads on it, especially when it is hot. Do not submerge it in water. If this should occur, dry it out before applying voltage.

In the event that air flow through the Probe is considerably reduced by what appears to be a blockage, apply the air pressure line to the front end and blow down the unit to clear the blockage.

Item	Description	Part No.	Remarks
System	Environmental Probe System	7002-0001	Complete
(1)	Tubing Assembly	1325-0006	
(2)	Kit, Tip, Chamber 1 ea. Flat Tip 1 ea. Round Tip	7002-0002	

SPRAY SYSTEM

PURPOSE:

The Spray System provides the basic means for dispensing any material of a sprayable viscosity; i.e., Coatings, Lubricants, Solvents, Paints, etc. Principle features of the Unit are:

1. Rotatable nozzle tip to permit ready access to most areas.
2. Rapid replacement of nozzle tips, should clogging occur.
3. Rapid switch-over to any sprayable material.
4. Fine dispersion spray.
5. Efficient material usage for individual spraying jobs.
6. Easily cleaned and maintained.
7. Non-contaminating elements.

SET-UP:

Fill the container one-half to two-thirds full of the material to be sprayed. Assemble one of the downspouts to the threaded underside of the Spray Nozzle Assembly Cap by turning it into the thread like a screw. Assemble the Spray Nozzle Assembly Cap to the container. Attach the Control Assembly by inserting the control fitting into the tapered end of the nozzle and the disconnect fitting into the Pressure side of the Power Source.

Set the Pressure Flow Control to MAX. position. Sequence the Power Source for Foot Pedal activation on the Mechanical Output. Depress Foot Pedal to supply air pressure. Now, by applying the thumb to the open port of the control fitting (see Fig. 2,) a fine spray of the material from the tip end of the nozzle can be thumb-controlled. The tip may be rotated to spray difficult to reach areas.

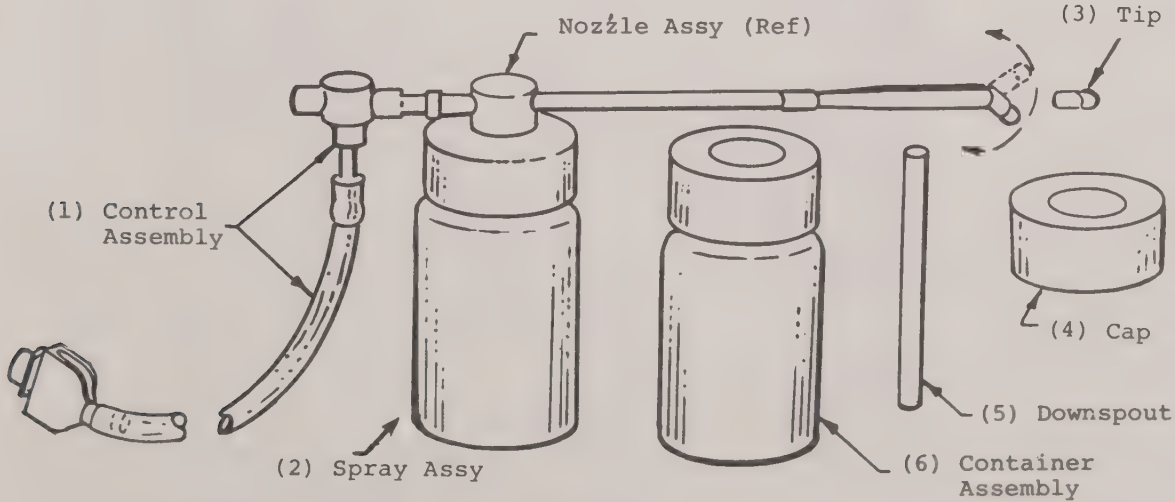


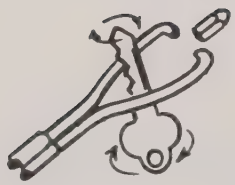
Figure 1

CLEANING:

To clean the unit, attach to a solvent-filled container and spray clean. Should the Tip become clogged, remove the Tip by wedging and rotating a coin or key between the side tubes and pry apart. (See Fig. 2.) Determine if the tip was the cause of the clog; if so, replace it with a new Tip (leave the clogged Tip for cleaning with wire later) by prying the tubes apart, as previously described. Make sure the score mark on the new tip is face down when inserting it. If the clog is in the nozzle tubes, use a wire to clean them out.

Almost any material of proper consistency can be sprayed from this System. Switching from one material to another is readily accomplished by unscrewing the Spray Nozzle Assembly Cap from the container and capping the container with the provided spare cap. The Nozzle Assembly may now be moved to the next container of material. A spare downspout has also been provided to minimize the immediate cleaning requirement when switching from one material to another.

Spare containers, caps and downspouts can be provided to suit a complete series of materials. The Nozzle Assembly may be attached to the 4 oz. metal PACE Solvent container.



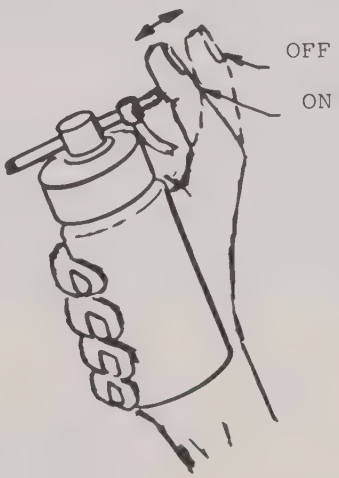


Figure 2

Item	Part No.	Description	Remarks
System	7011-0001	Spray System	Complete
(1)	1325-0009	Control Assembly	
(2)	6011-0001	Spray Assembly	
		Nozzle Assembly	Ref. Spray Assy.
(3)	1121-0081	Tip	
(4)	1311-0032	Cap	
(5)	1325-0005	Downspout	
(6)	1311-0002	Container Assembly	

VACUUM CLEANING:

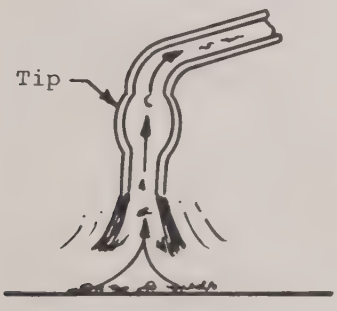
In performing the desired cleaning operation, select the Tip from the three supplied to best suit the removal of the specific material (normally this would be the Brush Tip.) Mount the Tip to the front end of the Body and establish vacuum as required. Now the unit may be used to vacuum clean the desired area. The Brush Tip permits agitation with vacuum cleaning. Should the material to be removed be gummy or oily, apply solvent and either air dry or use the Environmental Probe for rapid dry off. Now remove the materials via vacuum means. (See Figure 2.)

VACUUM TWEEZING:

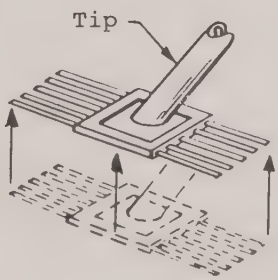
In using the unit as a vacuum tweezer, select the tip to suit the job. The parts can be picked up with the Tip vacuum and transported to another point and placed down by releasing the vacuum. The most delicate parts can be handled this way without damage. Should a situation exist which will not permit the use of the index finger for making and breaking the vacuum, the hole can be covered with tape and the Power Source remote foot pedal control can be used for making or breaking the vacuum.

MAINTENANCE:

This System requires no specific maintenance procedure except to avoid damaging the Tips with heated soldering irons, etc. If the System is used for Vacuum Cleaning, an auxiliary filter should be used to collect particles; otherwise, the filters within the Power Source will require more frequent cleaning.



VACUUM CLEANING



VACUUM HANDLING

Figure 2

VACUUM CLEANING AND HANDLING SYSTEM

PURPOSE:

This unit provides a controlled means for handling delicate parts by vacuum means without the danger of crushing or marring from mechanical tweezers. It also provides an excellent means for removing DRY dirt, grit, dust, etc., from delicate as well as difficult to reach surfaces and crevices.

SET-UP & OPERATION:

This unit is very easily hooked up to the Power Source. Attach the Tubing Assembly between the rear of the Body Assembly and the Quick-Connect Vacuum outlet of the Power Source. Set Vacuum Flow Control to MAX. position.

Mount the desired tip to the other end of the body. Sequence the Power Source for foot pedal activation of the Mechanical Output. With the foot pedal of the Power Source depressed to provide continuous vacuum, the On/Off vacuum control at the Tip is accomplished by placing or removing the index finger from the hole in the body. This will cause the full vacuum to prevail at the Tip. (See Fig. 1). Intermittent action can also be accomplished by switching the foot pedal to the ON position and using the foot pedal to activate the vacuum, while keeping the hole in the body continuously blocked.

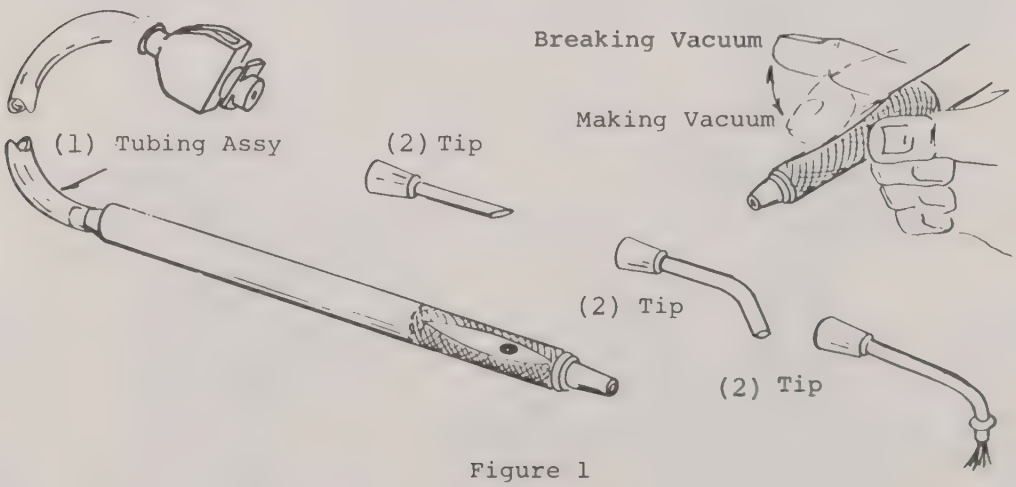


Figure 1

Item	Description	Part No.	Remarks
System	Vacuum Cleaning System	7014-0001	Complete
(1)	Tubing Assembly	1325-0006	
(2)	Kit, Brush & Tips 1 ea. Brush, 45° 1 ea. Tip, Vacuum, Straight 1 ea. Tip, Vacuum, 45°	7014-0002	

SWAB PLATING #PE-200A

PURPOSE:

The PACE Electro-Plating System #PE-200A has been evolved to provide the Electronic & Electro-mechanical repair man as well as the experimenter with the ability to perform high quality plating on a "short run" basis. A single package contains all of the elements required to perform, in conjunction with PACE "Work Centers" and MASTER POWER CENTERS, the average plating requirements. The unit is specifically designed for working with Circuit Boards, Contracts, Connector Pins, Small Wave Guide Cavities, Flexible Circuitry and many other elements associated with Electronic and Electro-mechanical devices.

BASIC UNIT MATERIAL & SOLUTION DESCRIPTION

Description	New Part #	Old Cat. #
Material		
Masking Tape, Platers	1289-0001	PE-301
Masking Tape, Copper Foil	1289-0002	PE-302
Tray, Rubber	1311-0010	PE-303
Power Leads, Plating	6003-0010	PE-201
Swabs, Pre-Wrapped	1123-0003	PE-203
Handles, Swab	4003-0001	PE-202
Shallow Dish	1311-0011	PE-304
Measuring Cup & Tank	1311-0012	PE-305
Stand, Plating	6019-0009	PE-205
Wash Bottle	1311-0004	PE-306
Solutions		
Copper, High Speed	6003-0002	PE-526
Copper, (Alkaline)	6003-0001	PE-530
Lead Alloy	6003-0003	PE-557
Nickel (Acid)	6003-0008	PE-560
Tin (Alkaline)	6003-0004	PE-595
Electro-clean	6003-0009	PE-410

NOTE: Precious Metal Plating Solutions are optionally available but are not included in the basic PE-200A Plating System.

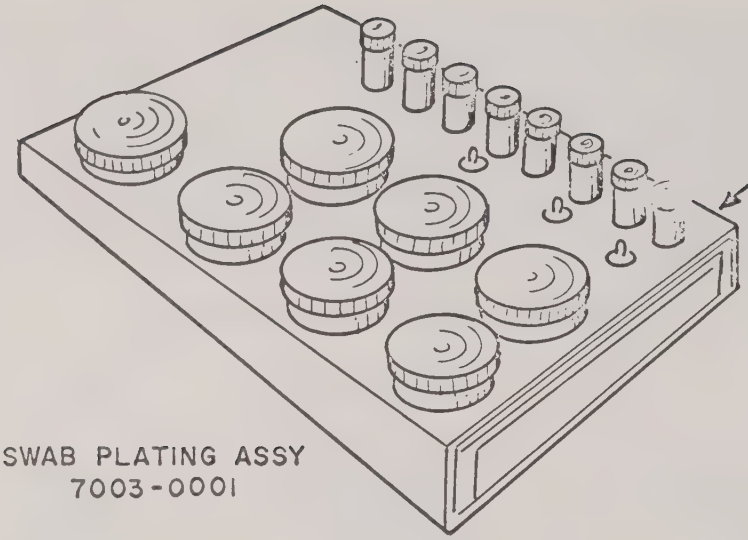
Solution		
Gold	6003-0006	PE-535
Rhodium	6003-0007	PE-580
Silver	6003-0005	PE-585

GENERAL DESCRIPTION OF SWAB PLATING

General Definition:

Controlled Electro-plating of a high speed nature on a small area segment of an overall workpiece without the use of plating tanks or the submergence of the part area to be plated.

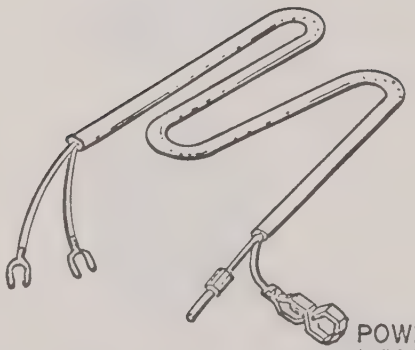
This type of plating may be accomplished by personnel without the depth of experience or technical training or "black magic formulations" usually associated with the operations of an electro-plating facility.



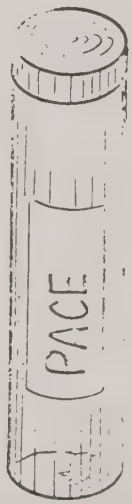
STAND, PLATING
6019-0007

SWAB PLATING ASSY
7003-0001

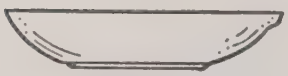
PLATING SOLUTION



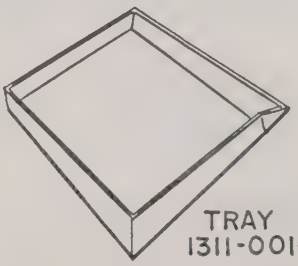
POWER
LEAD
6003-0010



SWAB CONTAINER

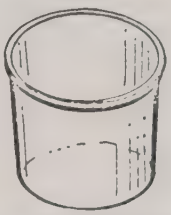


DISH
1311-0011



TRAY
1311-0010

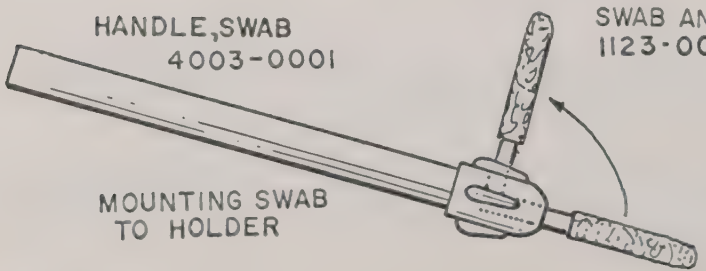
MEASURING
CUP
1311-0014



MINIATURE TANK
1311-0012

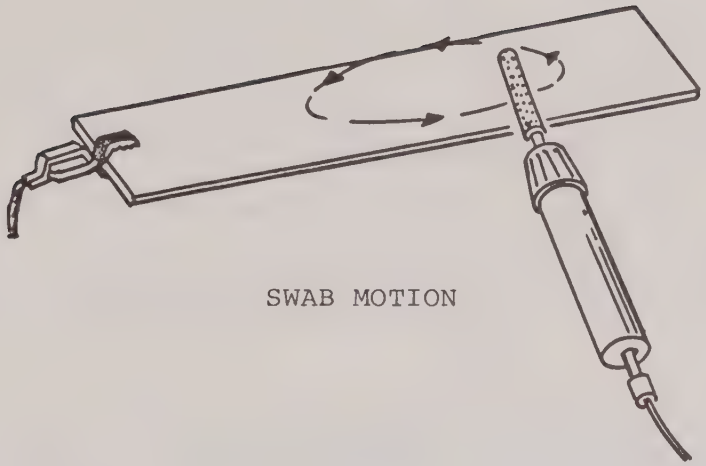
HANDLE, SWAB
4003-0001

SWAB ANODE
1123-0003



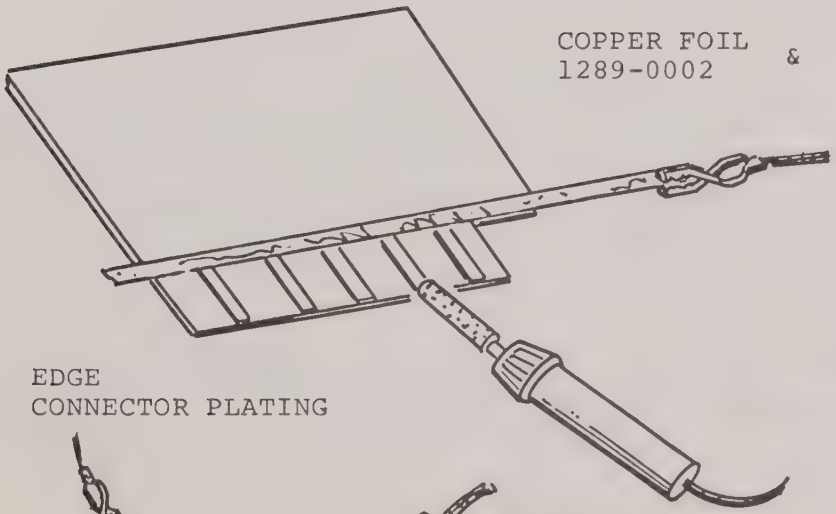
MOUNTING SWAB
TO HOLDER

WASH
BOTTLE
1311-0004

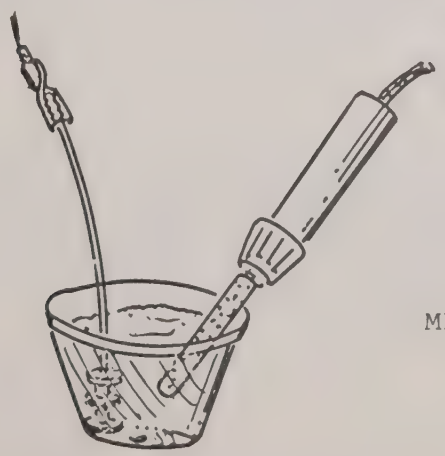


SWAB MOTION

COPPER FOIL 1289-0002 & PLATERS TAPE 1289-0001



EDGE
CONNECTOR PLATING



MINIATURE TANK
PLATING

"Essentially, we are able to electro-plate a localized area even after assembly of the unit."

APPLICATIONS:

Circuit Board Edge Connectors:

These connectors are primarily part of the circuit board copper pattern and will normally have the following platings:

a) Rhodium overplate of .00002" minimum thickness over a nickel underplate of .0005" thickness.

b) Gold overplate of .00005" thickness over a nickel underplate of .0005" thickness.

c) Tin-Nickel plate of .0002" minimum.

To repair any of these contacts should the original plating be worn down to the base copper or if some good original underplating or overplating remains, follow these steps: a) abrasively remove the plating (use PACE Miniature Machining System); b) apply underplate of Nickel (acid); c) apply an overplate of Gold or Rhodium.

Circuit Board Conductive Patterns:

The conductive pattern (not including eyelets & plated thru holes) of a circuit board will normally be electro-plated to offer solderable surfaces and corrosion protection and may be one of the following types:

a) Tin-Lead (Solder Plated) of .0003" minimum thickness.

b) Gold overplate of .00005" minimum to .00010 maximum thickness. with nickel underplate of .0005".

c) Tin-Nickel plated of .0002" minimum thickness.

d) Solder coated of .0003" minimum thickness (hot dipped and not plated.)

e) Tin plated to .0003" maximum thickness.

The value in repairing platings of circuit patterns of a completed assembly or in field repair of circuit boards becomes questionable since the corrosion resistance qualities of the copper itself is quite good and PACE Protective Coating (supplied with all Work Systems) wiped over exposed areas will act as an additional corrosion prevention agent. However, in prototype work the desired plating can be applied as required.

Soldering to base copper is readily accomplished without additional plating. Should the copper laminate be so badly thinned during a repair procedure, it can be built up by using the High Speed - Copper plating procedure. However, if an overplate is desired, you can replate the circuit pattern to meet its original make up. Either the Tin-Lead (Solder Plate) or the Gold may be used to meet any of the end conditions desired. PAD or Terminal areas of the circuit board may require a rebuilding of the solderable over-platings to permit ease of sweating joints with eyelets or terminals that may have no Solder or Tin plating of their own.

Eyelets & Terminals:

Eyelets & Terminals may have been plated up with Tin-Lead (Solder); Gold; Tin or Solder coated (dipped not plated) to the thicknesses defined in "Circuit Board Conductive Pattern."

Plated-Thru Holes:

Normally the Plated-Thru Holes have a wall of .001" thick copper with an overplate of Tin-Lead (Solder), Tin-Nickel, Gold or Solder Coated per thicknesses defined in "Circuit Board Conductive Pattern."

If during a repair action the Plated-Thru Hole is ruined, it should be replaced with a "fused eyelet" using the PACE fused eyeletting unit or with a funnelet if the "fused eyeletting" unit is not available. (Data on "fused eyeletting" procedures for repair and prototypes will be found in the PACE Fused Eyeletting System Elements Section if the unit was included in your "Work System".)

In prototype work, Plated-Thru Holes can be produced by first applying "Electro-less copper" (not normally supplied with PACE plating systems) and then plating the holes as if they were small tanks, with a contact ratio of 1/1.

Connector Pins & Contacts

The thousands of different connector types used in the electronics field establish a broad potential for worn off or damaged platings on individual pins.

When this occurs, there is no need to disassemble the entire connector. With the PACE Swab Plating system we can replate the pins while they are still assembled to the connector.

Usually the connector pins are either Beryllium-Copper, Copper, or Brass with a gold overplate. Where the overplate has worn off or peeled away, clean off all loose materials with the PACE Miniature Machining System and prepare the surface by electro-cleaning the underplate with nickel and overplate with gold to restore original contact or pin quality. Should the application of the swab technique prove impractical, then the miniature bath method can be employed.

In the case where a connector is bent or broken and no replacement is available, a new connector can be made using the PACE Miniature Lathe System. After machining a new connector, plate it as you would a worn part, as described above.

Others:

Items such as Wave Guide Cavities and literally hundreds of other elements may have their platings worn out or damaged in use. In most cases they can be repaired in the field with the PACE Swab Plating System.

Should you have a specific problem not covered by this manual, please advise us: we may have the solution. (No Pun Intended!)

PLATING SOLUTION CONDUCTIVITY & SOLDERABILITY

Copper is one of the metals with the highest electrical conductivity, but it is subject to corrosion. The oxide formed by corrosion is of lower conductivity. Gold is one of the most popular conductive materials in the electronics field and although lower in conductivity than copper, it is extremely corrosion resistant.

PACE's Gold plating solution is a pure 24K. gold with high conductivity characteristics. It also acts as a solid lubricant for sliding electrical parts.

PACE's Tin (alkaline) and Tin-Lead (solder) platings provide excellent solderability characteristics.

BASIC PRINCIPLE

The workpiece is normally maintained electrically negative (-) or cathodic by attachment of the negative clip lead from the DC power supply. The positive side of the DC power is applied to an insulated handle which is electrically tied to a wrapped, swab type of anode (+). The swab anode is then saturated with the plating or part preparation solution and applied to the workpiece with a relative motion between the anode swab and the workpiece. The plating action which ensues

will be of a quality equal or better than the most desirable tank plating method while still offering a highly localized plating action.

CONTROL

Primary control elements for rate of plating, and quality of plating are as follows:

a) Current density at which plating is done. This is related to the voltage setting of the power supply and the ratio of the area of contact of the swab anode to the workpiece. (This is called the CONTACT RATIO). Recommended voltage settings for the pre-wrapped anode swabs are noted for each plating solution.

b) The brushing or swabbing action of constant motion, speed of motion, as well as pattern of motion are also controlling factors. These control the evenness of the deposit, prevent burning due to no or low relative motion and control the porosity of the deposit.

c) Thickness of the plating is primarily related to time and current density. Rate of plating is noted for each plating solution in terms of inches per minute at an assumed Contact Ratio of 1/3.

USES OTHER THAN PLATING

Although the primary purpose of this unit is for electro-plating, by reversal of polarity of the swab anode (+) and workpiece cathode (-) to the opposite polarities ((swab (-) and workpiece (+)) and with the use of other types of solutions the following processes are possible: Electro-polishing, etching, metal removal (chem-milling), and deburring. These are neither covered in this manual nor included in the basic PE-200 system.

PREPARATION OF SWAB ANODES

Each anode has been pre-wrapped and is packaged separately in its own container. It is essential that the same anode be used for the same solution at all times in order to avoid contamination. Be sure to note on the swab container the type of solution that you use a specific swab for and return it to the same container each time.

A swab that has been used for a specific solution and then returned to its properly marked container for storage, may harden up with time in storage. When it is desired to re-use the swab again for its designated solution, soften it thoroughly with warm, clear water (only a fraction of a minute is required), then remove the absorbed water with paper toweling. The swab can now be used by saturating it with its designated solution.

The anode swab is mounted to the handle like a cartridge, by loosening the handle cap, inserting the metallic end of the anode swab into the side hole and rotating it into the side slot, until it seats, then screwing down the cap so that it holds the anode swab tightly against the conductive fitting of the handle. An "O" ring has been provided to prevent solution seepage down the handle.

Swab anodes for different plating solutions may be interchanged in the same handle quite readily in the preceding manner.

Should an anode break, discard it and substitute a new anode swab for that solution.

SWAB SPEED & MOTION

Relative Motion:

It is absolutely essential that a relative motion be established between the anode swab and the workpiece surface. This can be accomplished by moving either the swab and keeping the work fixed, by moving the work and keeping the swab fixed, or by moving both.

Type of Motion

On flat surfaces, to obtain uniform thicknesses of deposit, a circular motion plus a lateral motion (combined motion is orbital) is preferred to a straight back and forth movement. A straight back and forth motion will favor excessive build up of plating at the two reversing points unless traveling onto stop off areas, is accomplished.

Circular or Round Parts would be more easily handled by rotating the workpieces. However, this may be impractical, so apply the swab by wiping it along the surfaces circumferentially or orbitally as the case would indicate.

Speed of Motion.

Too low a relative surface speed will result in defective plating deposits. These will be evidenced by an obvious burn in the case of copper or silver deposits. For soft metals; i.e., tin or cadmium, a slow speed will tend to give indications of spongy and porous deposits. Nickel plating with too slow a surface speed will show up somewhat darkened and eventually turn rough and brittle. Even if relative surface speed is not too slow to give defective deposits, a slow relative speed will result in plating of a coarser, more porous grain structure. In most instances it is desirable to create dense, non-porous grain structures to assure best corrosion resistance, qualities and prevent migration of base metals through the overplating.

Now that we have cautioned you on too slow a relative surface speed let us establish a desired speed at which to do almost all of your plating to assure the best possible plating results. In essence, a surface speed of 30 to 50 feet per minute will suit almost all the plating and electro-cleaning materials with which you will be working and will provide a non-porous, high density, fine grain plating. In light of this, we have selected approximately 30 feet per minute as a standard speed. This establishes a consistent relative speed so that we can best control the quality of plating and predict results.

To get a feel for this speed (30'/minute) take a 12" scale and in a period of approximately 2 seconds (use a counting method) travel the full distance of the scale. This would represent the minimum speed while the maximum speed would be approximately twice as fast. Once you get a feel for the minimum speed, try to establish this speed in all of your plating.

Exception - The only exception to this established speed is in the plating of Rhodium. With this material, the speed of plating should be from 5 to 10 feet/minute or approximately 1/6th the standard plating speed. Try to establish a feel for this speed. The other exceptions in speed would apply with electro-polishing action which is 1 to 5 feet/minute. Each of the PACE solutions provided will indicate Swab speed as a reminder.

PLATING THICKNESS CONTROL

PACE Swab Plating is accomplished at extremely high speed as compared to bath plating since we are only plating a small selected area and our plating solutions are of extremely high densities. The plating deposited with the PACE unit is usually in the area where the anode swab (saturated with solution) contacts the work surface. The two major factors in establishing the rate at which plating will be deposited are:

1. The ratio of area of contact between the anode swab and the total work surface to be plated. (Contact Ratio.)

2. The voltage setting at which plating is done.

Since the first factor can vary with each plating situation, a rule for estimating the ratio would be to divide the area of swab contact by the total area to be plated. NOTE: - In areas where the swab will travel over areas which have gaps in plating surface; (i.e., Circuit Board edge connectors, etc.) the area to be plated should include the non-metallic surface area as part of the overall estimate of the surface to be plated. To estimate the rate of plating and the thickness build up, let us assume for a given situation the swab area of contact is 1/3 of the total area to be plated (a 1/3 CONTACT Ratio,) and using our standard prescribed plating voltages, the build up of plating would be as follows:

Plating Material	Avg. Time (in sec) to deposit .0001
Copper (Acid) High Speed	4
Copper Alk:	10
Tin Alkaline	12
Nickel Acid	24
Lead	12
Gold	20
Silver	10
Rhodium	60

Should the swab area be equal to the plating area (a 1/1 Contact Ratio) then the plating build up would be three times as fast; i.e., .0001 nickel in 8 sec. or .0003 nickel in 24 sec. Should the swab area be 1/6 of the plating area (a 1/6 Contact Ratio) then the build up to .0001 will take twice as long; i.e., .0001 nickel in 48 sec., etc.

We have thus established a plating thickness control using Time. This is essentially an averaging means and a good method for repair work in electronic and electro-mechanical equipment. Each solution provides Deposition Rate information based on inches/minutes for a 1/3 Contact Ratio. This deposition rate should be modified by the Contact Ratio for the specific job involved.

It must be remembered, however, that when using time as a means for controlling thickness, the swab anode must be kept well saturated with plating solution and only the time when the swab is in contact with the work surfaces should be counted as the total time of the plating action. It should also be remembered that to obtain even plating thicknesses we must try to cover all surfaces to be plated with a equal amount of time. It is also desirable that the plating solutions and workpiece be approximately at room temperature to avoid variances in plating rates due to temperature.

The second control factor for plating is the voltage at which it is done. Each of the plating solutions supplied defines the VOLTAGE setting at which to perform the plating.

SURFACE PREPARATION - GENERAL

Cleaning:

"PERFECT CLEANING IS A PRIME PREREQUISITE TO GOOD PLATING."

Cleaning should be accomplished not only in the specific area to be plated but also in any adjourning area over which the plating solution may run in order to avoid contaminating the solution as well as assuring work area cleanliness.

Remove all greases and oils from the surfaces with the solvent supplied with all PACE Work Systems. Remove heavy corrosion, flaked or poorly adhered previous platings, oxides, coatings and other contaminants from the surface with the PACE Miniature Machining System by employing the supplied abrasive wheels and brushes.

Stopping Off:

With the platers tape provided, "stop off" the area to be plated so that it is left exposed while the area where plating action is not desired is dammed off or blocked so that the plating solutions will not run onto them.

Establishing Electrical Continuity:

In those cases where the clip type cathode (-) can be attached to the workpiece, electrical contact can be made with the clip itself. However, if the workpiece does not lend itself to this, use the supplied copper tape (Electro-clean the uncoated side of the tape first) in conjunction with the platers tape to create a press-on electrode for strapping across circuit board edge contacts, or use heavy gage #14 copper wire to attach mechanically to pins or solder it onto the surfaces to create the electrical circuit. Now the cathode clip can be attached to the wire or copper tape to complete the circuit.

MASTER POWER CENTER SET UP

The plating power cord has one end color coded (Red & Black). Attach the lugs of this end to the corresponding colored Red & Black terminals of the Master Power Center's DC output.

Set up the sequence of the Power Center so as to provide untimed remote pedal control of outputs. (See section on Master Power Center). Now flip the POLARITY switch to the Normal position, which will provide DC polarity as marked at the DC output terminals. The depression of the Foot Pedal will now apply power to the cord. Before applying power, connect the other end of the power cord consisting of the clip (cathode) to the workpiece and the banana plug. (Note: Banana plugs flatten with number of insertions and should be pried open occasionally) to the swab anode holder. (CAUTION: Before applying power, make sure the swab anode and clip cathode do not touch each other causing a dead short.)

To set the desired DC voltage, flip the meter switch to the ON position and depress the pedal, causing DC output to be energized. You can now set the DC voltage with the Variable Power Control knob and get a direct reading of this voltage on the DC voltmeter. With the voltage properly set to suit the plating solution being used, switch the meter switch to OFF and release the Foot Pedal. You are now ready to perform operations and can observe the current draw on the DC Ammeter. Remember: You will have to reset the DC voltage for each plating solution used.

PLATING PROCEDURE - GENERAL

1. In all cases, after thoroughly cleaning the work surfaces and "Stopping off" the area as previously described, the preliminary step is to Electro-clean the area with the Electro-cleaning solution provided. This should be done for the number of seconds and voltage called for in the Plating Preparation description which follows.

2. Between each plating step, water wash the work area thoroughly (use the provided wash bottle) and permit run off of water to fall into the provided drip tray. When going through two or three steps in a plating sequence, use the water wash between each step to clean off previous solution as well as to prevent dry off between steps which can cause failure of deposit. When working with the anode swabs and solutions, you can dip directly into the solution containers with the swabs (Except with the silver solution, see Silver Plating) but you must be sure that a swab is used permanently for one solution only so as not to contaminate other solutions. Remember to keep each swab, not in use, in its marked container in order to avoid mix ups. When swabbing the work surface with a plating solution, keep the swab saturated and be sure to work over the drip tray and not over solution containers, thus avoiding contamination and maintaining a clean work area. Drying off of the workpiece after plating can be done with paper towels or use the PACE Heat Probe which is provided with most PACE work systems.

PLATING PREPARATION FOR BASE METALS

Copper, Beryllium Copper & Brass:

A. Clean the surfaces per Preparation - General

B. Electro-clean (Polarity Switch - Normal Position) using Electro-cleaning solution at 8 volts for 15 to 30 seconds. This should remove light tarnish and fingerprints. Rinse thoroughly.

C. Swab surface with the solution being plated (silver excepted) before the current is connected.

D. Electro-plate the surface per the plating solution instructions. (Underplate nickel in most cases, add an additional pre-flash of Gold plating for Silver overplate. See special Silver instructions). Rinse and dry.

Zinc, Tin, Solder Alloys

A. Clean the surfaces per Preparation - General

B. Brush (using PACE Miniature Machining System) all solder alloys with water wet brass wire brush.

C. Electro-clean (Polarity Switch - Normal Position) at 8 volts for 5 seconds and rinse thoroughly.

D. Immediately plate with Copper-Alkaline solution to cover the entire surface with copper color. Rinse.

E. Continue plating to the desired thickness with the metal required. Rinse and dry.

Aluminum and Aluminum Alloys

A. Clean the surfaces per Preparation - General

B. Abrade the surface with a wire brush (PACE Miniature Machining System) or a fine abrasive material.

C. Plate immediately with Copper-Alkaline (within 15 seconds) to cover the area abraded. Rinse thoroughly.

D. Plate to the desired thickness with plating solution. Rinse and dry.

PLATING SOLUTION USE

CAUTION: - PACE plating solutions are primarily water solutions and, with the exception of GOLD, contain no cyanides. Even so, as with good industrial practice, care should be taken so that no solution is splashed in or near the eyes. Hands should be washed thoroughly and at frequent intervals to avoid carrying residual solution to the mouth and to prevent prolonged skin contact. Some persons with sensitive skin may be allergic to specific solutions and should avoid prolonged or repeated contact.

When working with Gold, do not work in a warm area since fumes from the Gold will dissolve in perspiration and concentrate there. Also, if hands have cuts, avoid contact with the Gold in order to prevent localized concentration and seepage into the body.

Areas in which plating is done need to have only a reasonable air change rate without special exhaust fans or hoods.

Gloves are not normally used but would be desirable when Gold plating, as previously indicated, and for Silver plating since Silver is light sensitive and tends to turn the skin a dark brown color shortly after contact.

None of the solutions are flammable, thus no fire hazard exists.

Nickel (Acid) Plating

The Nickel-Acid solution is primarily used for underplating in thicknesses of approximately .0003" - .0005" between a base copper surface and an overplate of Rhodium or Gold. It may also be plated directly to mild steel.

Nickel-Acid	-	#PE-560
Swab Speed	-	30'/minute
Voltage	-	6 volts
Deposition Rate @ Contact Ratio 1/3	-	.0002"/minute

In plating Nickel-Acid on all basic metals except aluminum, the surface should first be wet with the solution before applying power to the anode swab.

Copper (High Speed) Plating

This solution will give a rapid build up of thickness which is its intended purpose. It should never be used directly on base materials but should be put over an underplate of .0003" - .0005" copper-alkaline. This material can be put directly over a base copper metal by first wetting the copper with the solution before applying power to the anode swab. This material can be used to fill or bridge small voids and will make satisfactory deposits of .0005" thick and over.

Copper - High Speed	-	#PE-526
Swab Speed	-	30'/minute
Voltage	-	6 volts
Deposition Rate @ 1/3 Contact Ratio	-	.001"/minute

Copper-Alkaline Plating

Copper alkaline is ideally suited to underplating applications on base Aluminum surfaces. It is also used for thin copper build ups of under .0005 in thickness (over .0005, use Copper-High Speed). It may be plated directly to mild steel.

Copper-Alkaline	-	#PE-530
Swab Speed	-	30'/minute
Voltage	-	4 volts
Deposition Rate @ 1/2 Contact Ratio	-	.0003"/minute

Solder (Tin-Lead) Plating

Tin-Lead alloy solder plating can be accomplished with the PACE unit. Since the life of the Tin-Lead alloy solution is relatively short, (approx. 4 hours) we have supplied the Tin (Alkaline) #PE-595 and Lead #PE-555 as separate solutions which can be mixed in small batches as required to create the Tin-Lead alloy solution.

To create a 60/40 solder alloy for plating requires mixing 30% by volume of the Lead solution with 70% by volume of the Tin (Alkaline) solution: to create a 50/50 solder alloy requires mixing 40% by volume of the Lead solution with 60% by volume of the Tin solution. To simplify mixing of a solder plating solution, use the small cup provided and mix thoroughly two cupfuls of Tin with one cup full of Lead in the dish. This will provide a solder alloy of approximately 55/45 which is suitable for solder plating circuit boards and which can be applied directly to base copper materials.

Solder Plating thickness for circuit boards should be .0002" to .0003".

Solder Alloy

Tin (Alkaline)	-	#PE-595
Lead	-	#PE-557
Swab Speed	-	30'/minute
Voltage	-	6 volts
Deposition Rate @ 1/3 Contact Ratio	-	.0005"/minute

Gold Plating

PACE Gold plating solution is ideally suited to printed circuit contacts as well as other electrical contact devices; i.e., pins, slides, etc. It will provide both the corrosion resistance of a noble metal as well as natural lubricating qualities. It may also be used to great advantage on flexible circuitry and tape cable. For consistancy of quality in plating copper and preventing copper migration thru the gold, gold requires a nickel underplate. The gold plating thickness normally required for circuit board edge connectors is .00005" over a nickel underplate (See Nickel Plating.)

Gold itself should be used as an underplate flashing (.00002" thick) when high wear resistance Rhodium is used as an overplate.

Gold	-	#PE-535
Swab Speed	-	30'/minute
Voltage	-	4 volts
Deposition Rate @ 1/3 Contact Ratio	-	.0001"/minute

CAUTION: Remember gold is the only PACE solution containing some cyanide and should be used with the general cautions defined under Plating Solution Use - General.

Rhodium Plating

This material is ideally suited for high wear resistance and is used on circuit board edge connectors to a great extent. It should not be used directly on copper surfaces but requires a gold underplate Flash (See Gold Plating) or Nickel underplate (See Nickel Plating) to provide good quality adhesion. Rhodium plating thickness should be .00002 to .00005.

It may also be used on small, high speed DC motor commutators to provide both wear characteristics as well as to reduce radio interference.

Rhodium	-	#PE580
Swab Speed	-	5'/minute
Voltage	-	4 volts
Deposition Rate @ 1/3 Contact Ratio	-	.00005"/minute

Silver Plating

Silver should not be deposited directly onto copper or brass. A gold flashing or strike should be applied first (only enough to color the surfaces gold is necessary. Approximately .00001" thick.) The gold flashing (seeGold Plating) should cover more than the area to be overplated with silver to avoid any direct contact of the silver with the copper or brass. This is to avoid copper contamination of the silver which will turn the silver solution purple in color.

Based on this fact, the silver plating solution should be used in small quantities, and not directly from the main solution container (pour off a little solution into the shallow dish provided.) When the solution turns purple (not light lavender) it should be discarded and replaced with fresh material.)

Silver is heat and light sensitive and will degrade in bright light. Keep it stored in a cool, dark place to obtain the best shelf life.

Good silver deposits will have a slightly yellowish or gray-black color (not very bright - which is a sign of brittleness.) This discoloration can be brought up to brightness by abrasive polishing with the PACE Miniature Machining System. This should be done before plating Rhodium over silver.

Silver	-	#PE-585
Swab Speed	-	30'/minute
Voltage	-	8 volts
Deposition Rate @ 1/3 Contact Ratio	-	.0005"/minute

Tin (Alkaline) Plating

This plating material offers excellent solderability characteristics and may be used as an underplate for Tin-Lead (Solder) overplating or by itself to create solderable surfaces.

Tin	- #PE-595
Swab Speed	- 30'/minute
Voltage	- 6 volts
Deposition Ratio @ 1/3 Contact Ratio	- .0005"/minute

Other Plating Available:

Should your requirements indicate a need for plating on surfaces and metals other than those covered herein or should you be performing other types of plating, please advise PACE of these needs as many plating solutions and methods may be available.

MINIATURE TANK PLATING

Although we primarily cover the swab anode method of applying platings throughout this document, there are many cases where plating specific parts is not suited to this method due to the part's small size or configuration; i.e., Terminals, Eyelets, Connector Pins, etc.

In these cases, miniature tank plating can be the answer. Essentially we have provided a small cup which might be considered the tank. The solution to be used is poured into the cup and the part itself (with a copper lead wire attached, which in turn is attached to the clip lead cathode) is immersed in the solution. The swab anode may now be placed in the cup beside the part and without touching it will cause a bath plating action to occur when the recommended voltage for the solution is applied. The contact ratio would be considered 1/1 and plating will occur all over the part at once, as in a tank.

Thus, with this method, we can machine small "pin type" parts in the field from bar stock and plate them up to requirements in short order.

When completing a miniature bath type of deposit, discard the plating solution remaining in the bath to avoid contaminating your main solution supply.

WORK HANDLING AND POSITIONING SYSTEM

PURPOSE.

Eliminating damage to the Workpiece "during handling" is a prime consideration to assure the reliability and quality of an item under repair. To control this, a means for Work Handling and Positioning has been incorporated into the System.

The supplied Work Holding and Positioning Unit is suited to the repair needs for a broad range of modules, chassis and connectors. For best results, familiarize yourself with all its elements and use your own ingenuity for specific jobs. (See Fig. 2.)

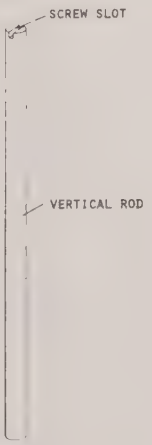
The Unit provides controlled clamping action with a tensioner in the right arm assembly. A center support limits flexing in thin PCB's.

The vertical height of the fixture may be adjusted to suit the comfort of the individual. It is recommended that the arms contact the work surface so that you can rest your wrists and forearms on the work surface to increase stability while decreasing fatigue.

Another basic operating feature is 360 degree rotation of the clamped Workpiece with locking at any angle. These two primary features plus support stability and accessories provide system versatility.

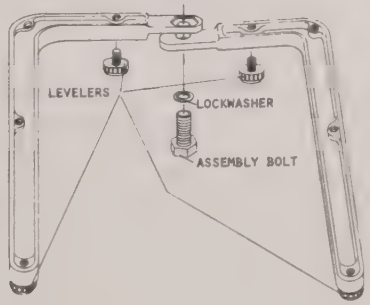
SET-UP.

Universal Base - See Fig. 1 for Assembly details.
The Universal Base consists of a left and right arm, a vertical rod and a bolt and a lock washer for Assembly.
Six base levelers assure steady support.



WORK HANDLING ASSEMBLY:

a) Slide Adjustment Support Assembly onto Vertical Rod.
b) Assemble Universal Arm and Tension Arm to Cross Bar. (See Fig. 2.)
c) Tighten Adjustment Locking Knobs to suit the job at hand.



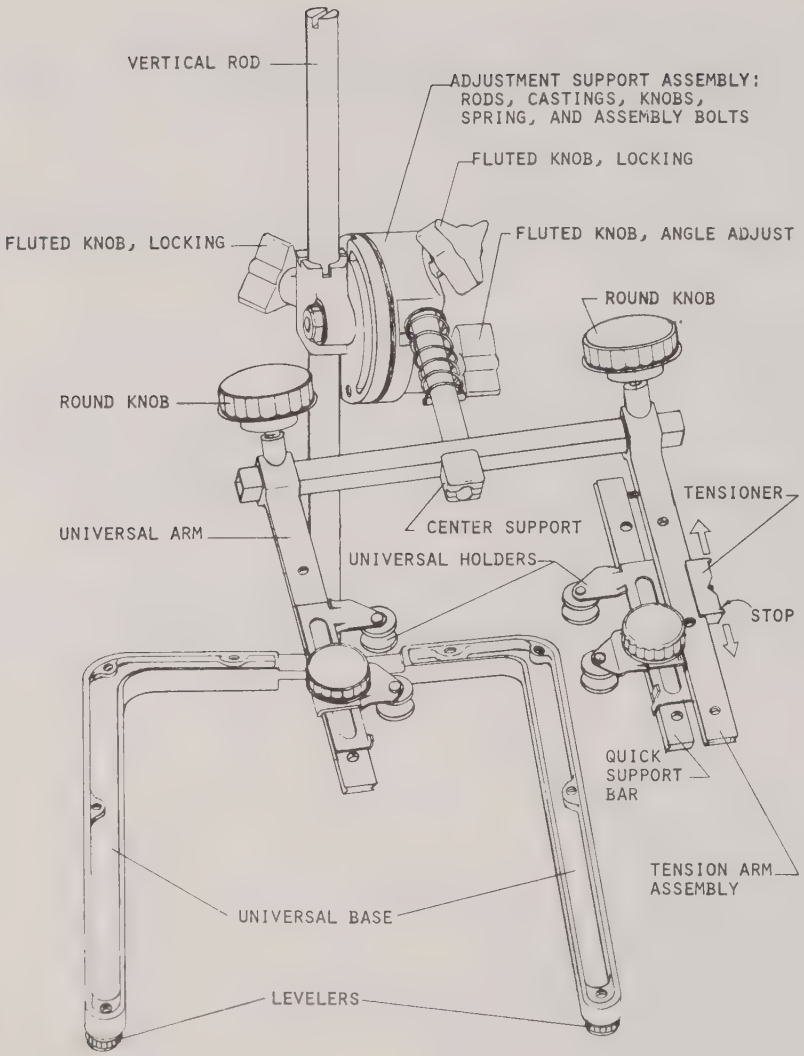


Figure 2

Mounting the Workpiece: (Study Fig. 2.)

a) Slide the Tensioner to its stop, retracting the Support Bar.
b) Place Workpiece between arms or connector holders. The "V" grooves in the arms grip the PCB's.
c) Slide arms towards each other, centering the Workpiece. Tighten Arm knobs.
d) Release Tensioner to apply spring loading by Quick Support Bar to Workpiece.

Universal Holders:

The Universal Holders attach to the Work Handling Unit Arms. They provide adjustable cushioned gripping of connector and small circuit boards. (See Fig. 1.)

The set consists of a left and right assembly, each with a knob for attachment and convenient adjustment to suit the Workpiece.

PARTS LIST

Description	Part No.	Remarks
Work Handling & Positioning System #WP-6	7015-0009	Complete
Universal Arm w/Knob	6015-0011	
Tension Arm Assembly w/Knob	6015-0020	
Universal Holders w/Knobs	6015-0026	
18" Cross Bar Extension - Optional	1344-0007	
Adjustment Support Assembly	6015-0021	

OPTICAL LIGHTING SYSTEM #POL-15

This unit provides the primary illumination and optical aid for the Work Center. It is ideally suited to the average "small" class of work to be performed and may be supplemented by other optical aids when working on miniature classes of work.

OPTICS.

The special lens is a large, rectangular shape of over 21 square inches in area. It provides extremely high resolution, very low distortion, and a very long depth of field. Dimensionally, it permits the use of both eyes (binocular effect) to simultaneously maintain complete focus on the work area without strain. The magnification level of the lens has been established to ideally suit continuous use on average small sized Workpieces, while providing low distortion, fine resolution and excellent depth of field.

LIGHTING.

A pair of flexibly mounted high intensity lights are incorporated for providing balance lighting of the work area in conjunction with the lens. The lights may also be used on the work area, without the lens in position, thus providing a highly flexible lighting system suited to other supplemental optical devices. Each light has its own ON/OFF switch.

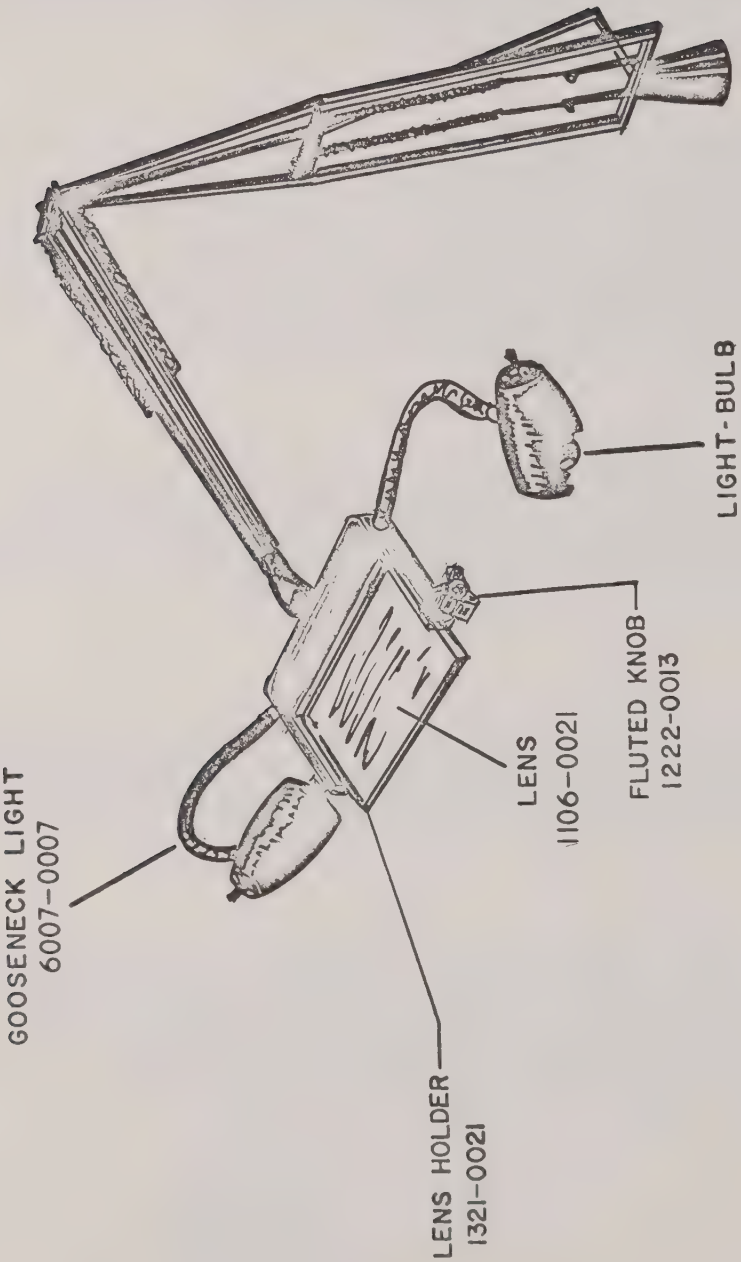
MANIPULATOR.

The optical and lighting elements are mounted to a balanced manipulating arm which permits locating the entire system anywhere over the Work System operating area. This flexibility in positioning provides an ideal integration of the Optical Lighting System to total Work System.

MAINTENANCE.

The light bulbs have approximately 250 to 300 hours of continuous operating life. Spares should be kept available. Care should be exercised to keep from scratching the lens. The provided cover should be put over the lens when not in use and the lens should be cleaned off with a clean, soft cloth or paper only.

Description	Part #
Light Bulb	1165-0001
Lens	1106-0021
Light, Gooseneck	6007-0007
Cover, Lens	1313-0017
Optical Lighting System Complete	7007-0004



OPTICAL LIGHTING SYSTEM - POL-15

OPTICAL LIGHTING SYSTEM #POL-11

This unit provides the primary illumination and optical aid for the Work Center. It is ideally suited to the average "small" class of work to be performed and may be supplemented by other optical aids when working on miniature classes of work.

PARTS IDENTIFICATION

1. Bulb
2. Lens
3. Lighting Fixture Assy.
4. Lens Holder
5. Universal Base (Optional)

OPTICS.

The special lens is a large, rectangular shape of over 21 square inches in area. It provides extremely high resolution, very low distortion, and a very long depth of field. Dimensionally, it permits the use of both eyes (binocular vision) to simultaneously maintain complete focus on the work area without strain. The magnification level of the lens has been established to ideally suit continuous use on average small sized Workpieces, while providing low distortion, fine resolution and excellent depth of field.

LIGHTING.

A pair of flexibly-mounted, high intensity lights are incorporated for providing balanced lighting of the work area in conjunction with the lens. The lights may also be used on the work area, without the lens in position, thus providing a highly flexible lighting system suited to other supplemental optical devices. Each light has its own ON/OFF switch.

MOUNTING.

The optical and lighting elements are mounted to a manipulating arm which permits locating the system over the operating area. This flexibility in positioning provides an ideal integration of the Optical Lighting System to the total Work System.

MAINTENANCE.

The light bulbs have approximately 250 to 300 hours of continuous operating life. Spares should be kept available. Care should be exercised to keep from scratching the lens. The provided cover should be put over the lens when not in use and the lens should be cleaned with a soft cloth or tissue only.

PARTS LIST

DESCRIPTION	PART NO.	REMARKS
Optical Lighting System, #POL-11	7007-0005	Complete
Lighting Fixture Assembly	6007-0007	
Light Bulb	1165-0001	
Lens Bracket	1211-0010	
Lens, Magnifier	1106-0021	
Lens Cover	1313-0017	

THERMAL WIRE STRIPPER

PRINCIPLE.

Almost all insulated wire can be stripped with this unit, with the exception of very thin insulations which should be stripped with the PACE Chemical Stripper. The unit will strip wire between #12 through #30 and with care can be used for wires as small as #43. Power is supplied to the unit through a Universal Cord. Basically, the main working element is a pair of blades (See Fig. 1) which are heated up by current flow.

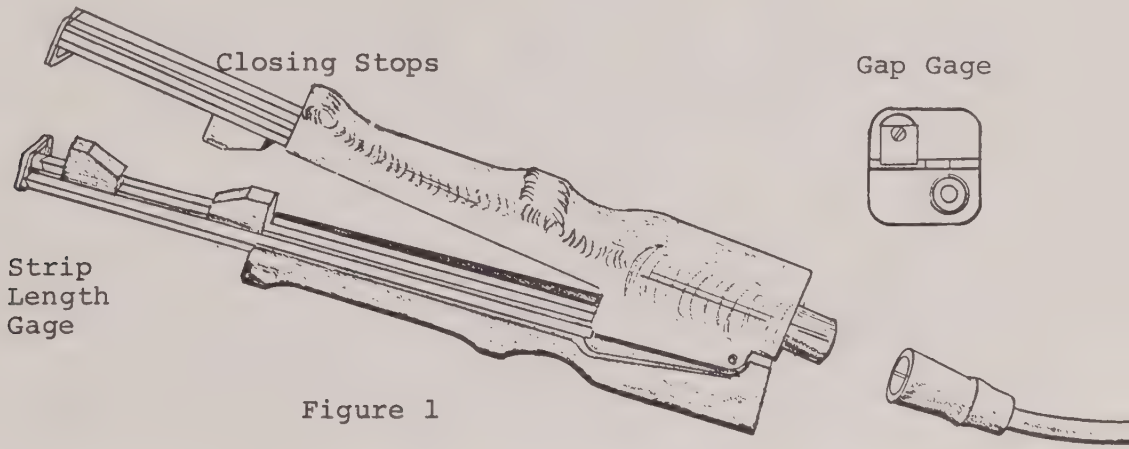


Figure 1

Current is controlled by Foot Pedal Activation in conjunction with an Electrical Mode of Operation. When the Foot Pedal is depressed, the current flows through the blades, heating them up. When the Pedal is released, the current will cease to flow and the blades will cool down. Force for applying the blades to the wire insulation is controlled by the pressure exerted on the handles.

The proper use of this unit requires the coordination of force with the control of Blade "heat up" (Workpiece Indicator technique.) A little practice is therefore necessary to get the feel of the unit and establish the understanding of its operation. It is very similar to controlling a soldering iron since the total heat that is applied to the Workpiece is operator controlled.

PRELIMINARY CONSIDERATIONS.

Before proceeding, make sure that the portions of the blades do not have sharp edges or corners. If they do, smooth them off with a file or any available abrasive before using the unit. This will prevent the blade

from scraping the conductor during the stripping action. A notch may be filed in the lower blade for indexing or locating the wire between the blades, but when stripping very small wire sizes, it will be necessary to work with un-notched blades or avoid laying the wire in the blade notch to assure circumferential penetration of the insulation. (See Fig. 2).

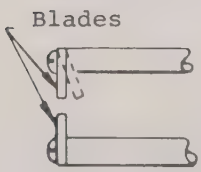
If you find the unit does not heat up as quickly as you would prefer, file the back side of the blade evenly, as shown in Fig. 2, to achieve more heat at the blade surface.

If a number of identical length strips are to be made, set the Strip Length Gage by sliding it along the electrodes to the desired dimension from the blades. If it is not to be used, push the Gage as far back as it will go to get it out of the way. With most maintenance work it will be more desirable to strip longer than the desired length and cut off the extra length to suit the requirement after tinning.

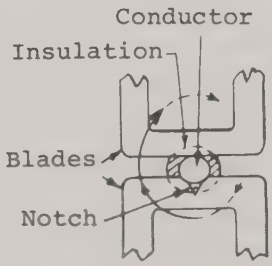
In addition to the Strip Length Gage, the unit is provided with Gages for regulating the opening gap between the blades, as well as the closing point, if blade contact is not desired. To reduce the opening gap between the blades, turn the screw (Fig. 1) of the Gap Gage in a clockwise direction. For a larger opening gap, turn the screw in a counter-clockwise direction. The two closing stops can be adjusted to permit closing the handle to a desired gap opening which will prevent nicking the conductor. The closing stops slide easily along the electrodes.

CAUTIONS: - The unit is designed for the cyclic application of heat to the blades. Under no circumstances should heat be continuously applied to the blades for more than 90 seconds, as they will degrade rapidly with an extended Red Hot condition.

DO NOT DEPRESS FOOT PEDAL WHILE ATTACHING HANDPIECE TO UNIVERSAL CORD OR UNIVERSAL CORD TO THE POWER SOURCE.



ADJUST BLADE ALIGNMENT



ROTATE SLIGHTLY

Figure 2

OPERATING PROCEDURE:

Wire Insertion & Clamping.

a) Take wire stripper in palm of hand.
b) Using the free hand, insert wire between blades, making sure it lays in the notch of the lower blade (if notch is used) and push the end of the wire against the Strip Length Gage if it is used.
c) Close the jaws so that the blades apply a light pressure to the insulation.

Heating Action: - Depress the Foot Pedal while maintaining pressure of the blades on the insulation. The blades will heat up in two seconds or less and, depending upon the applied pressure and type of insulation, they will penetrate at different rates. As penetration occurs, rotate the blades or the wire being stripped, through wrist action. This will assure a circumferential penetration of the insulation and clean separation.

Heating Release: - At this point judgment in usage of the unit is most essential since, if the heat is maintained too long, it can proceed through the insulation and "overheat" the conductor. Release Foot Pedal when insulation is properly penetrated without releasing light clamping action. There have been many temperature control methods tried with varying success. The best is the temperature indicated by the rate of movement of the blades through the insulation.

With PVC or other similar plastics, relatively low temperatures can do the job easily and the Foot Pedal should be released just as the blades start to move through the insulation, since they will retain enough heat to complete the job. On the other hand, Teflon requires that the blades be "Red Hot" before proper penetration can take place. In any event, it is important that we apply the necessary levels of heat to complete the job as quickly as possible. It is a good idea to familiarize yourself with various wire types and sizes to get a feel for the unit.

Pulling Action: - After releasing the Foot Pedal, and without removing light clamping pressure, allow the blades to cool for one or two seconds, then pull the wire with the clamped stripping blades, rotating the tool slightly in the direction of the natural lay of the strands. This will withdraw the stripped insulation. Clamping pressure can now be released.

Although the operational steps appear time consuming, in actuality the total stripping operation is accomplished in approximately four seconds. Intricate strip actions, such as Co-axial cable can be accomplished. (See Fig. 3.)

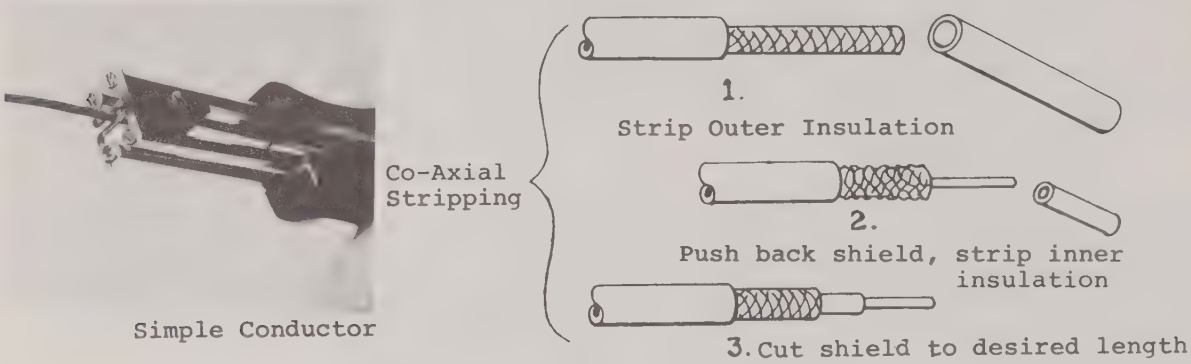


Figure 3 THERMAL STRIPPING

MAINTENANCE.

The unit requires very little maintenance. Over a period of time the blades may become encrusted with residue. In that event, it can usually be brushed off. Allowing the unit to heat up to a red hot condition without exceeding 90 seconds in time, will usually burn off thin residue. When replacing blades, it may be necessary to adjust their alignment by bending with a pliers. (See Fig. 2.)

Item #	New Part #	Description	Remarks
System	7012-0002	Thermal Stripper	Complete
(1)	1121-0003	Blade	

RESISTWEEZ(TM) #TW-15

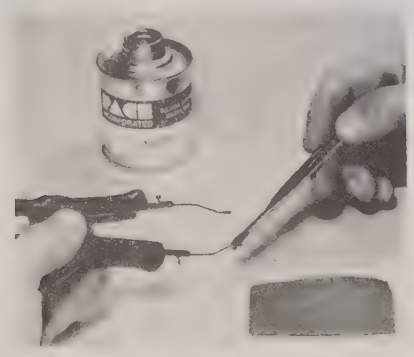
PRINCIPLE:

The ResisTweez resistance tweezer heating unit is intended for a diverse range of heating and soldering work when it is undesirable or not possible to use soldering irons or to ground the entire Workpiece for "Probe Heating" techniques. It offers a highly localized heating method for terminals, connector pins, etc., even when closely spaced. The unit consists of:

1. ResisTweez Handpiece (used with Universal Power Cord.)
2. Pair of Tweezer Tips.

Essentially, any Workpiece clamped by the Tweezer Tips will be rapidly heated by the current flow at the clamp contact points. This particular unit is ideally suited to small pins and terminals with the limitation that the heat-up of the Workpiece (pin or terminal) should be more rapid than the small Tweezer Tips. NOTE: - If, in a given application, the Tweezer Tips heat more rapidly than the Workpiece, it would indicate that a higher capacity tweezer unit is required.

USE:



Keep contact area of tips bright and clean with solvent and abrasive paper.

Figure 1

Tips may be modified. Bend or file, as required. Screws must be tight.

Figure 2

a) Workpiece and Tweezer Tip contact surfaces should be cleaned so as to provide low surface contact resistance.

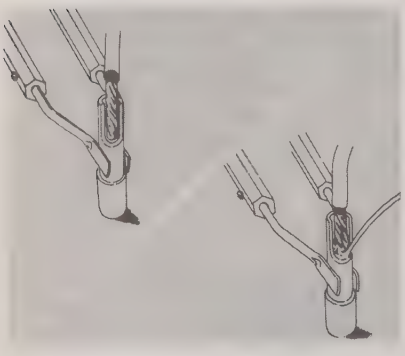
b) Do not apply Power until Tweezer Tips have positively engaged the work surface to avoid arcing.

c) Do not remove Tweezers from contact with work surfaces until Power has been cut off. This will prevent arcing effects.

d) Be especially careful when applying Power, as too long a time period can cause overheating. Solder melt is indication for cutting off Power.

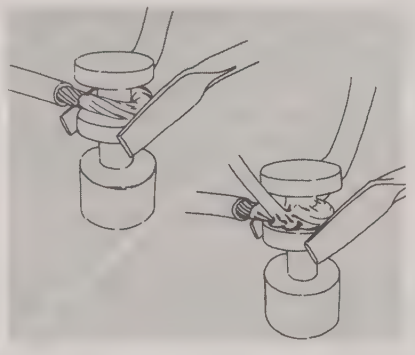
HOOK-UP & POWER ADJUSTMENT:

Connect the Universal Cord to the Power Source and connect Handpiece to Universal Cord. CAUTION: - Never attempt to connect accessories to Universal Cord when Power is ON. Sequence the unit for foot pedal activation of the Electrical Output. Settings will vary with various Workpiece configurations. Always start at the low end of the control and adjust up to the proper setting. Since the range of use for the Tweezer is so diverse, it should be remembered that increased user familiarity will add to its capability.



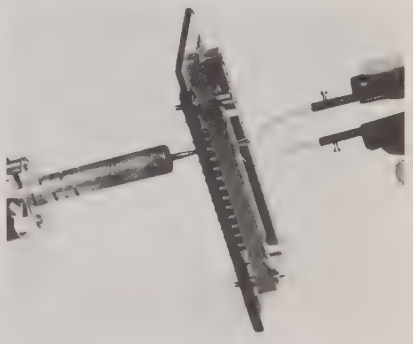
Grip work piece between electrodes with light firm pressure. Depress Foot Switch for heating. Pre-tin or flow in solder.

Figure 3



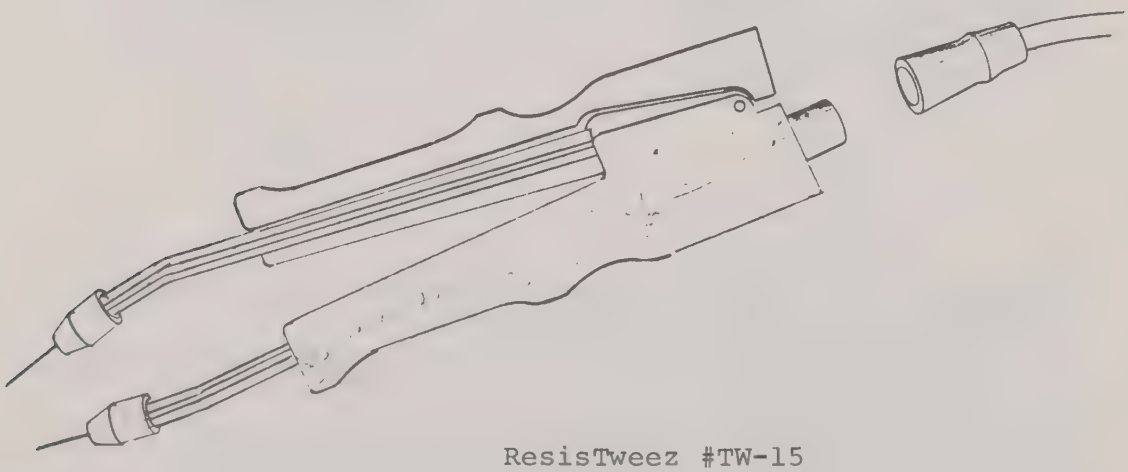
Use for soldering or desoldering. Release foot switch before removing tips from work to prevent arcing.

Figure 4



Use for auxiliary heating during solder extraction operations.

Figure 5



ResisTweez #TW-15

DUTY CYCLE:

The use of the Tweezer is naturally of an intermittent nature. Within this framework of usage and within the normal wear and strength of the tips, the Duty Cycle of the Tweezer is more related to the Power Source's defined Duty Cycle.

The PACE ResisTweez is ideally suited to Rework, Repair and Short Run Production needs. Your ability and familiarity with the unit are primary to expanding its application range.

CAUTION: DO NOT ACTIVATE ELECTRICAL POWER WHILE ATTACHING UNIT TO UNIVERSAL CORD OR UNIVERSAL CORD TO POWER SOURCE.

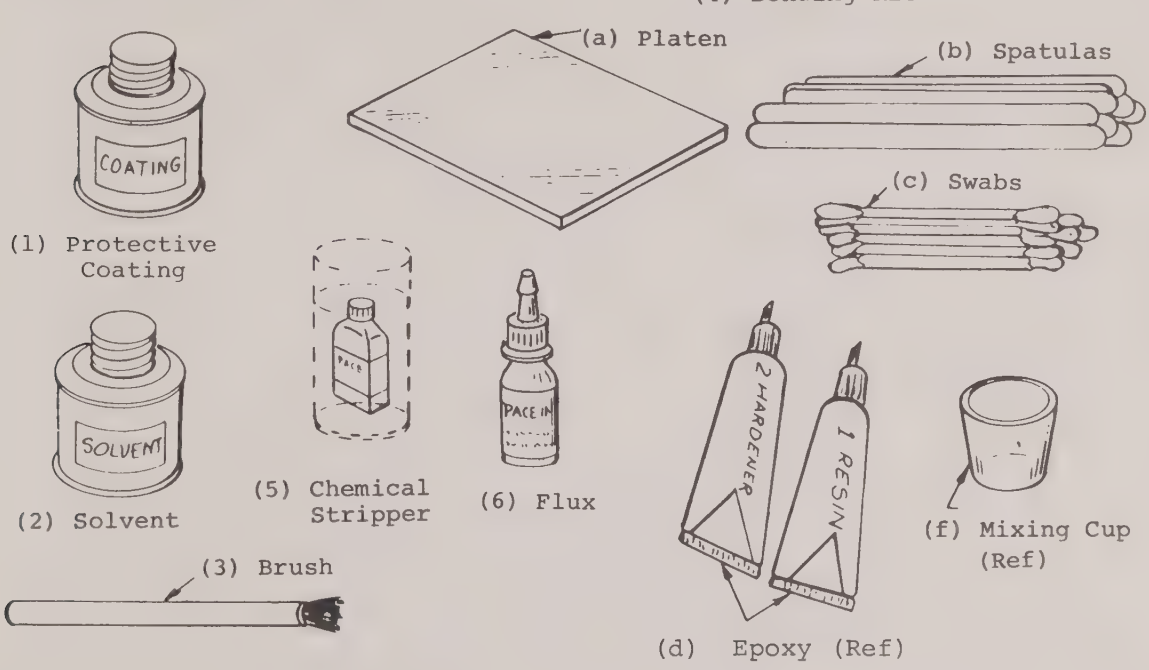
PARTS LIST

Item	Description	Part No.	Remarks
System	#TW-15 ResisTweez	7009-0005	Complete
(1)	Tip, ResisTweez	1121-0006	
(2)	Collet, Nut	1348-0063	

MATERIALS

A series of Materials required in the repair of electronic equipment have been included in the System. The application of most of these materials has already been covered within preceding sections of the manual. Other application potentials for each item are varied, depending upon the imagination of the user.

Some of these elements may not have been supplied with your system since they are of an Optional nature. Any of these materials are immediately available from PACE, INC.



Item #	New Part #	Old Cat. #	Description	Remarks
System		T-300	All Items	Complete
(1)	6999-0003	T-130 (D.C. 630)	Coating Kit	
(2)	6997-0001	T-140	Solvent Kit	
(3)	1127-0001	T-106	Brush, Stiff	
(4)	6999-0002	T-150	Bonding Kit	Complete
(a)	1143-0001	T-122	Platen	Ref. Bonding Kit
(b)	1123-0001	T-132	Spatulas, Wood	Ref. Bonding Kit
(c)	1123-0002	T-131	Swabs, Cotten	Ref. Bonding Kit
(d)	6999-0001	T-120H&R	Epoxy, Pts 1 & 2	Ref. Bonding Kit
(e)	1311-0013	T-121	Mixing Cup	Ref. Bonding Kit
(5)	6998-0001	CS-306	Chem. Strip Kit	
(6)	6994-0001	T-123	Flux, Liquid	Optional

TOOLS.

This item consists of the following High Quality hand tools which provide the needs common to a broad variety of Electronic Repair problems:

Description	Quan/Unit	PACE Part#	Remarks
Tools PACE # T-400	1 lot	6993-0029	Complete
Diagonal cutting Pliers, PACE#T-117	1 ea	1100-0006	
Flat nose pliers, PACE #T-113	1 ea	1100-0002	
Extra fine needle nose pliers, PACE #T-114	1 ea	1100-0003	
Short Chain needle nose pliers, PACE #T-115	1 ea	1100-0004	
Round nose pliers, PACE #T-112	1 ea	1100-0001	
Heat Sink Clamp, curved, PACE #T-109	1 ea	1100-0061	
Two strand sizes of cord solder	1 lb	1243-0001	
	1 pkg	6996-0001	
Mirror, extended 45^0 PACE #T-103	1 ea	1106-0012	
Tweezer, serrated, PACE #T-105	1 ea	1100-0041	
Pencil-Type soldering iron with clad tip PACE #T-101A	1 ea	1102-0004	
One tapered tip for Micro-miniature work	1 ea	1121-0132	Optional
Miniature tool set, PACE #SPW-5, 21 pcs. Screwdriver blades, Allen wrench blades, Socket wrench blades, Phillips head blades, end wrench blades and handle	1 set	7016-0004	
PACE Red Line #1 oxide remover unit	1 ea	1129-0014	
PACE Grey Line #1 oxide remover unit	1 ea	1129-0013	
Miniature heat sinks,	5 ea	1209-0001	
Adapter Polarized plug, PACE #T-118	1 ea	1207-0024	

ECOPE